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EDITORIAL.

Interdependence of Agriculture and Health Measures.

The Malaria Advisory Board of the Federated Malay States appointed a Sub-committee to enquire into the subject of *Anopheles maculatus* breeding in silt and aeration pits on rubber estates. This Sub-committee consisted of officers of the Medical and Agricultural Departments, the Institute for Medical Research and the Rubber Research Institute of Malaya. The opinions and recommendations of the Sub-committee are embodied in the statement prepared by them and published in this number of the *Malayan Agricultural Journal.*

The Sub-committee has requested that the advisory officers of the Department of Agriculture should consistently emphasise the importance of the possible ill-effects on health of any agricultural methods involving pitting or draining. In view of the importance of maintaining the health of the labour force, agriculturists cannot afford to ignore such a warning.

The rapid development of tropical agriculture during the past twenty-five years has been made possible by the progress of medical science, and in this connection, the pioneer work of Sir Patrick Manson and Sir Ronald Ross's epoch making discovery of the rôle played by the mosquito in the propagation of Malaria has led to the adoption of sanitary and anti-malarial measures which have not merely rendered tropical agriculture an economic success, but have made possible the development of agriculture in regions that otherwise would have remained undeveloped.

Another great medical discovery is that connected with the name of Finley whose theory, propounded in 1881, on the cause of yellow fever was in 1900 confirmed by an American Commission whose findings led to a definite policy for combating this disease. Epidemics of yellow fever, so long associated with large tropical cities, ceased in consequence of the adoption of these measures, resulting in a marked effect on agricultural development especially in South America. One cannot, for instance, visualise the development of the Cuban sugar industry under the former yellow fever conditions.

In many other instances, medical science has conferred inestimable benefits on agriculture. Such maladies as hookworm, dysentery, beri beri, and yaws, took their not inconsiderable toll of the labour force and hampered agricultural deve-

lopment. The solution of these and many other medical problems has led not only to a reduction of the wastage of the labour force, but to a consequent marked influence on general labour efficiency.

It will be noted that the present trend of medical science is to concentrate more on the prevention of disease than to provide successful treatment; this can only be accomplished by endeavouring to secure higher standards of sanitation and hygiene than those previously accepted.

The co-operation of the public with the health authorities is essential if advantage is to be taken of the considerable research work achieved.

It is only by the efforts of planters, in consultation with their visiting medical officers, that strict sanitary measures can be economically operated. While planters should try to adopt agricultural practice to medical requirements, the equal recognition by sanitary authorities of agricultural requirements is also indicated. It is only in this way that health on estates can be maintained and improved. It is almost inevitable that at times the interests of the planter and the health authority should conflict. Such conflict of interests can only be overcome—and may in fact frequently be avoided—by close contact between the agriculturists and the health authorities that shall result in securing greater understanding and harmonious work to their mutual benefit.

Large Scale Padi Planting. The view is generally held that padi is an unsuitable crop for large scale production on account of the amount of labour necessary for its production and the difficulty of using heavy machinery owing to the irrigated condition of the land. While this view may be true for narrow valleys and areas on which adequate water supply is impossible, it has been refuted in the many countries that have perfected the essential requirements of this crop. The bulk of the world's supply of rice is still obtained from India, Siam, and Indo-China, where the cultivation is mainly in the hands of small holders, but the cultivation of the crop on a plantation scale is steadily increasing in importance. The growing demand for rice, which is hardly balanced by an increase of production from the above-mentioned three sources of supply, indicates that in the future, large scale production of rice will be a widely recognised agricultural policy.

Large scale production of rice has made considerable headway, for instance, in Spain, Northern Italy, California, Louisiana, and on another page of this number will be found an account by Mr. J. W. Jolly of an even more recent overture in the cultivation of wet rice under irrigation in Australia.

It is a significant fact that in all these countries where padi is grown on a large scale, the yields are higher than those obtained by native methods. For instance, Spain with over 100,000 acres produces an average of 5,000 lbs. of padi per acre, Italy with nearly 300,000 acres has an average crop of 3,600 lbs. per acre, California, over 100,000 acres gives an average yield of 2,660 lbs. per acre, Louisiana with nearly half a million acres gives an average crop of over 2,000 lbs. per acre. Contrast these figures with Malaya which has about 600,000 acres

under this crop, producing an average yield per acre of about 1,300 lbs. The Krian Irrigation area is an exception to the low local yields, the yields on that area been equal—if not surpassing—those of any other country. But this only emphasises the importance of perfect water control, which is given close attention in areas on which padi is cultivated on extensive holdings.

Summing up the reasons for the success of padi cultivation, one finds that not only is close attention given to the water problem, but that tractors and other machinery are extensively used, manuring is a usual practice, rotation of crops is recognised as a system of padi cultivation and—in Italy—animal husbandry is closely connected with the padi areas. The extent to which these systems are adopted, of course, depends on the local circumstances obtaining in the particular country.

The above stated instances give a denial to the idea that padi is only suitable for the small holder and point to the fact that once conditions in Malaya are adjusted to enable such methods to be employed, similar systems involving the use of machinery can be applied to rice just as to wheat, oats or barley.

While the day may be far distant when such schemes materialise, nevertheless, the idea of extensive new areas cultivated by intensive methods of cultivation can be visualised by those that are concerned with what is probably the most important problem of the tropics; namely, the future of the World's Rice Supply.

The World's Trade in Rubber. Attention is directed to an abstract in this issue of a recent Report of the Imperial Economic Committee on a Survey of the Trade in Rubber Manufactured Goods. The figures quoted in the review are significant in shewing the relative importance of the United States of America market, and the pre-eminence of her manufactures of all kinds of rubber goods; and the uncertainty of expansion in European countries.

The science of production has made great strides during recent years. This in itself renders of even greater importance economic studies of this description. In the present economic crisis, the application of scientific method to the study of economic problems is the only safe avenue of approach to discussing a remedy. It is for this reason that the series of economic studies of the Empire Marketing Board and kindred organisations are of such importance. The former body giving detailed attention to all the great Empire industries. A perusal of the Reports leads to an appreciation of present markets in the light of which it becomes more possible to adjust our ideas on production and future possible avenues for extending our markets.

Coconut Cultivation. Mr. B. Bunting, Agriculturist, as a result of an official visit to Ceylon, has presented a report which embodies his observations on various aspects of agricultural practice in that Colony. In view of the premium obtained for copra of Ceylon origin, planters in this country will be interested to read this study of the Ceylon methods of production.

Original Articles.

SILT-PITTING ON ESTATES IN RELATION TO MOSQUITO BREEDING AND MALARIA.

A Report by the Malaria Advisory Board in conjunction with the Agricultural Department and the Rubber Research Institute.

Since silt-pitting became a widespread practice in rubber estates in the Malay Peninsula, the larvae of dangerous anophelines, notably of *Anopheles maculatus*, have been found by many observers and on many occasions in water standing in silt-pits both on hillsides and on comparatively flat land. The tendency for *Anopheles maculatus* to breed in such pits undoubtedly becomes greater where other natural waters are regularly and efficiently oiled, the anopheline being thus driven to breed in what might not naturally be selected as a breeding place. It may, therefore, be accepted that silt-pits and other trenches which hold water for sufficiently long intervals, and are situated within a radius of some forty chains from dwellings, are a menace to health. This state of affairs has led in some cases to an apparent conflict between the agricultural requirements of silt-pitting in rubber, and the medical requirements of antimalarial work; but the supposed antagonism becomes the less pronounced the more closely it is examined.

The main aim of all earthwork systems on undulating or hilly land is to stop surface wash of water during heavy rainfall, and to induce the water to percolate naturally through the soil. In old-planted rubber this is usually best attained by silt-pitting with bunds.

There is no necessity for water to be held in catchment pits for any length of time; indeed, it may be said that if the water remains for days at a time it is best from an agricultural, as well as from a medical point of view, that means should be taken for its quicker removal. If, therefore, the rate of percolation into the soil cannot be sufficiently improved, the measures taken should be made to simulate the normal drainage of flat land. Here stops are dispensed with, and the trenches form a continuous system, so that water can be readily carried off. On sloping land of such a heavy character the conditions to be aimed at would cause the contour drains to run to a common outlet, and with a view to preventing wash during heavy rain artificial stops of a pervious nature may be erected (rubble, brushwood, etc.) A system of this kind would let the water trickle away without permitting sudden rushes. Drainage systems on this principle for such special cases have already been reported as functioning successfully in Malaya.

Where the soil tends to be impermeable it is doubtful, however, whether any such steps can prove entirely adequate from a health point of view, since small puddles will always tend to remain at the bottom of the trenches however well they may be finished. These cases of great resistance to water penetration must be accepted as expensive and difficult both for antimalarial work and for soil cultivation. There is every reason that preventive measures against malaria (such as oiling) should be accepted as a standard practice in hill drains or pits under these circumstances, just as they are for other drains in flat land. The work will be more of a seasonal nature than on flat land.

To repeat, since silt pits or drains are necessary in old rubber, measures should be adopted within forty chains of dwellings for the prevention of anopheline mosquito breeding in any water retained in such pits or drains.

Such possible measures are:—

(a) Measures to prevent retention of excess water.

Although pits are used to conserve water in most cases, other cases arise in which removal by drainage is required just as on flat land.

(b) The use of larvicides, such as a suitable antimalarial oil mixture, applied in the usual way by spraying. The easiest method, however, for these particular conditions, is to apply liquid fuel (Diesel oil), with a very small mop. Oil applications on such stagnant water will be safe if done only once a fortnight. Such oiling of all water retained in pits in a residential area is being done at present by a number of estates as part of the regular anti-malarial work. Alternatively, the pits may be dusted with a dusting mixture containing Paris Green, which would need to be applied once in every five or seven days. Experience is not yet sufficient to compare the cumulative effects of such treatments upon the soil conditions.

(c) In flat land, trenches should be continuous, without stops. Small depressions on the land which retain puddles of water will be limited in number, and may be filled with loose soil without harm to the general agricultural system as regards rain percolation. In flat land deep water drains are advisable, connected with the natural drainage system of the area, and oiled or otherwise treated anti-malarially as part of that system.

Drainage in New Clearings.

In residential areas, it is preferable to make bunds. On hillside land, these should be made in connection with terraces; on flat land, bunds can be made by drawing together the surface soil. Such systems should always be adopted in the anti-malarial areas in new clearings, in place of pitting or digging trenches, unless such special soil conditions exist as would make pitting indispensable. These systems may be chosen both on anti-malarial grounds and on their own merits as regards permanence and efficiency.

COCONUT CULTIVATION IN CEYLON

BY

B. BUNTING,
Agriculturist.

Introductory.

With a view to investigating the various methods employed in the cultivation of coconuts and the preparation of copra as practised in Ceylon, the writer paid visits in February, 1930 to nine coconut estates in the North-Western Province of Ceylon.

The estates visited were situated in the districts of Veyangoda, Kurunegala, Negombo, Chilaw and Puttalam, which are recognised as some of the most suitable districts in Ceylon for the cultivation of this important crop.

It is estimated that the total area planted with coconuts in Ceylon is approximately 1,000,000 acres, while the total value of exports of coconut products from the Colony during the year 1929 was Rs. 60,024,466.

Exports of Coconut Products.—The following figures show the quantity and value of the various coconut products exported from Ceylon during the year 1929:—

	Quantity.	*Value.* Rs.
Coconuts, fresh ...	20,821,284 nuts	1,281,910
Copra ...	2,042,488 cwts	26,315,987
Desiccated coconut ...	690,469 ,,	11,875,780
Coconut oil ...	878,523 ,,	18,024,359
Fibre, bristles ...	199,923 ,,	1,713,667
Fibre, mattress ...	395,468 ,,	812,763

The above figures show a decrease of Rs. 7,964,337 in the value of exports of desiccated coconut compared with the year 1928. This is due to the loss of the American market owing to the high tariff which has been placed on this commodity in order to protect the Philippine industry.

At the request of the Ceylon Government, the Government of India has recently reduced the duty on fresh coconuts, which may cause a considerable increase in the exports of fresh nuts during 1930.

Climatic Conditions.—The following table shows the average rainfall and the number of rainfall days in the different districts:—

District.	Elevation ... *Feet.*	Rainfall *Inches.*	Rainfall *Days.*
Veyangoda ...	50	103.04	179
Kurunegala ...	400	82.33	163
Negombo ...	6	70.70	115
Chilaw ...	12	53.55	113
Puttalam ...	10	45.17	96

The mean temperature during the day varies from 85° to 90°F. in the shade.

General Conditions of Estates.

Situation of Estates.—The estates at Kurunegala and Veyangoda are situated about 45 and 15 miles from the sea respectively, while those at Negombo, Chilaw and Puttalam are all near the sea coast.

Nature of Land.—The lay of the land in both the Veyangoda and Kurunegala districts is gently undulating, but in all the other districts it is practically flat.

Soil Conditions.—The following is a brief description of the type of soils found in various districts:—

(a) Veyangoda ... Light loam on the flats and red gravel on the mounds.

(b) Kurunegala ... Rich sandy loam or very light clay on flats, with lights red laterite on mounds.

(c) Negombo ... Light sandy loam, with areas of white sand deficient in humus.

(d) Chilaw ... Varies from sandy loam to clay loam.

(e) Puttalam ... Light sand to sandy loam.

Area of Estates.—The average areas of the coconut estates visited varies from 400 to 1,000 acres each, but the largest estate has approximately 1,400 acres planted with coconuts.

Distance of Planting.—On five estates the distance of planting was 25 ft. × 25 ft. square or 70 palms per acre, on three estates 26 ft. × 26 ft. square or 64 palms per acre and on one estate 27 ft. × 27 ft. square or 60 palms per acre. It is generally considered that the distance of planting is much too close and that a spacing of either 28 ft. × 28 ft. triangular (64 palms per acre) or 28 ft. × 28 ft. square (55 palms per acre) would give much better results, particularly on the richer types of soils.

Age of Palms.—The average age of the palms on eight different estates varies from 35 to 45 years, but on one estate the average age is stated to be from 50 to 60 years.

Weeding.

The clean weeding of coconut areas is not practised in Ceylon and the majority of the estates are under light grass, which is usually kept grazed by cattle. On some estates, however, the grass is gradually being replaced by low-growing cover crops. Such areas are hand-weeded monthly, but those under grass are only weeded once in three months and this merely consists in the removal of shrub and the sensitive plant, *Mimosa pudica.*

Cover Crops and Green Manures.

A few of the more progressive coconut planters are beginning to realise the value of low-growing leguminous cover plants and on quite a number of

estates the grass is gradually being removed and *Dolichos Hosei* (Vigna) planted in its place. In the majority of cases where Vigna has become established it has shown remarkably good growth and forms a very thick cover, about 6 inches deep.

On one estate, however, where Vigna had proved a complete failure, *Calopogonium mucunoides* and *Centrosema pubescens* were giving the best results in areas of mature coconuts.

In cases where the ploughing of alternate rows of the cover crop is practised once in two years the plant then acts as a green manure and thereby adds considerable amounts of nitrogen and organic matter to the soil. Under this method of treatment the Vigna will establish itself again without replanting, more particularly when the ploughing is followed by the application of artificial manures. Many estates which have been for years under grass are now being brought back into condition by cultivation and green manuring.

The more shrubby types of cover plants, such as *Tephrosia candida* (Boga medeloa) and *Crotalaria anagyroides*, are also being grown to a certain extent as green manures. In such cases the seed is usually sown in lines either between each row or between alternate rows of coconuts. When the plants begin to flower they are cut back at intervals of about 4 to 6 months and the loppings allowed to remain on the surface as a mulch. At the end of two years the whole plant is uprooted and ploughed into the soil as a green manure.

The more woody types of green manures, such as *Erythrina lithosperma* (Dadap), have also been given a trial on some estates for the purpose of green manuring, but the results have been far from satisfactory and their cultivation with coconuts is not recommended.

Catchcrops and Intercrops.

On one estate, where an area of coconuts was interplanted with tea, annatto and fruit, the average yield was only 18 nuts per palm per annum, but a few years later, after the removal of these intercrops, the average yield on this particular area was increased to 62 nuts per palm per annum. This clearly indicates the danger of interplanting other permanent crops with coconuts.

Soil Conservation.

On a number of estates, contour drains, with stops every 20 to 25 feet, are dug on the undulating land in order to prevent soil erosion. The spoil is thrown on the upper side of the drain to form a continuous bund as is commonly practised in Sumatra.

Another method adopted for the same purpose is the construction of platform terraces round each individual palm. These terraces are about 12 feet square with a fall opposite to the slope of the land. A pit, about 3 feet deep and 18 inches wide, is dug at the lower side of the terrace and filled with coconut husks, which eventually become covered with soil. One of these pits

was opened and on examination a number of feeding roots of the palm were found penetrating the decaying husks in search of plant food.

Cultivation.

The general practice is to plough and harrow alternate rows every two years. The soil is usually ploughed to a depth of 6 to 8 inches and then harrowed with an ordinary disc harrow in order to break down the surface lumps.

On one estate ploughing is carried out once a year throughout the area and on another, each field is disc-harrowed only once every three months. Digging every alternate row with 'changkols' once in two years is also practised, but to a less extent.

During the operations of ploughing and harrowing, whether the land is under grass or green manure, large quantities of undecomposed vegetable matter are incorporated into the soil. This has the effect of improving the fertility of such light soils, which are naturally deficient in humus.

The results of experiments carried out at the Chilaw Coconut Trial Ground on a sandy soil clearly show that excessive cultivation on this type of soil and in such a dry district has resulted in a marked falling off in yield of copra per palm.

Manuring.

Considerable attention has been given to the problem of manuring and it is now generally recognised in Ceylon that more satisfactory returns can be obtained from coconuts by the periodical application of artificial manures.

The general practice is to apply from 14 to 16 lbs. per palm of a complete mixture every two years, but under the present system of manuring alternate rows every other year, each palm actually receives half the above quantity once a year.

The composition of the mixtures of artificial manures employed on different estates varies considerably and it is somewhat questionable whether equally good results could not be obtained by limiting the mixture to three forms of fertilisers supplying the three necessary ingredients of plant food, namely nitrogen, phosphate and potash.

The following shows (a) the various mixtures employed, (b) the method of application and (c) the quantity applied in each case:—

(1) A mixture containing 4 parts muriate of potash, 8 parts double kainit, 8 parts steamed bone meal, 10 parts crushed fish and 6 parts nitrate of soda.

This mixture is applied broadcast in strips 8 feet wide down the centre of the rows at the rate of 15 lbs. per palm once in two years.

(2) A mixture consisting of 30 per cent. crushed fish, 30 per cent. steamed bone meal, 10 per cent. nitrate of soda, 10 per cent. nitrate of potash and 20 per cent. muriate of potash.

This is broadcast in the rows, which have recently been ploughed, at the rate of 14 lbs. per palm every other year.

(3) A mixture composed of 4 lbs. fresh fish (crushed), ½ lb. nitrate of potash, ½ lb. muriate of potash, 3 lbs. steamed bone meal, 2 lbs. calcium cynamide and 2 lbs. Sylvinite (double kainit).

This is applied at the rate of 12 lbs. per palm every two years.

(4) A mixture of 6 parts steamed bone meal and 4 parts Sylvinite.

This mixture is broadcast in 4 foot circles, about 9 feet from the palm, at the rate of 12 lbs. per palm every two years.

(5) A mixture consisting of 8 lbs. steamed bone meal, 3 lbs. groundnut meal, 2 lbs. Nitrolim and 3 lbs. of sulphate of potash.

This is applied in circles 3 to 4 feet wide and 4 feet from the palm at the rate of 16 lbs. per palm every two years.

(6) A mixture comprising 8 lbs. steamed bone meal, 5 lbs. fish guano and 3 lbs. muriate of potash.

This mixture is applied in circles 3 feet wide and 3 feet from the palm, at the rate of 16 lbs. per palm once in two years.

(7) A mixture consisting of 3 parts calcium cynamide, 9 parts Seychelles guano, 3 parts Sylvinite and 5 parts kainit.

This mixture is broadcast in 8 foot strips between the rows at the rate of 20 lbs. per palm every alternate year.

Manuring Experiments.

The results of manural trials carried out at the Manning Coconut Trial Ground, Negombo, on a light sandy soil, show that good yields can be maintained on such soils by the addition of organic matter in the form of coconut husk combined with the application of potash.

The best results, however, were obtained by the application of a complete mixture consisting of 3 lbs. bone meal, 2 lbs. castor cake and 1lb. sulphate of potash. This mixture was applied at the rate of 8 lbs. per palm every year, i.e. half circles are manured every alternate year.

The following figures show the yield of nuts and copra obtained from the plot receiving the above mixture during the period 1925/1928:—

	Yield Per Plot of ½ acre.		*Calculated Yield per acre.*	
	Nuts.	*Copra. lbs.*	*Nuts.*	*Copra. lbs.*
1925	1,279	749	2,558	1,498
1926	1,420	843	1,840	1,686
1927	1,719	1,029	3,438	2,058
1928	2,152	1,246	4,304	2,492

In view of the poor type of soil on which these trials are being carried out the yields are remarkably high and are undoubtedly the direct result of manuring.

The former system of manuring was to tether cattle under the palms. The practice was to tie two head of cattle up to a palm for a period of 10 days and then dig the manure into the soil. It is estimated that under this system of manuring one head of cattle is required for every acre under grass. With the reduction of the areas under grass, owing to the planting of cover crops, very few cattle are now kept specially for this purpose, but use is still made of the working bulls.

With a view to determining the annual wastage of plant nutrients the following is a complete record of the various plant products removed annually from half an acre of coconuts, containing 35 palms, at the Manning Coconut Trial Ground:—

	Plant Products from ½ acre. lbs.	*Plant Products from 1 acre.* lbs.
Branches ...	2,644	5,288
Flower Stalks ...	760	1,520
Husks ...	2,728	5,456
Water in nuts ...	577	1,154
Poonac ...	339	678
Shells ...	743	1,486
Total ...	7,791	15,582

It will be seen that the husks form a large proportion of the plant products removed annually and therefore it is considered desirable that these should be returned to the soil in order to reduce the wastage of plant nutrients.

Although fair quantities of husks are consumed in the manufacture of coir fibre, it is the general practice on estates to make use of the husks either for mulching or manurial purposes. The nuts are always husked in the field after which the fibrous husks are usually placed in circles round the base of the palms, or in the rows between the palms, as a surface mulch. On some estates, however, the husks are placed in shallow trenches and covered with soil in order to accelerate their decomposition and thus provide additional plant food.

Diseases and Pests.

Bud-rot and stem-bleeding disease cause a certain amount of damage to coconuts in the North-Western Province.

The principal pests are the Black beetle, *Oryctes rhinoceros*, and the Red weevil, *Rhynchophorus ferrugineus*. An entirely new pest recently made its appearance on one coconut estate and is called the Nettle grub, *Parasa lepida*, which defoliates the mature leaves of the palm.

Lightning strike is frequently responsible for the loss of whole groups of palms on many estates.

Harvesting Nuts.

The system of harvesting the nuts at regular intervals of two months is universally adopted on coconut estates in Ceylon. This gives six pickings a year and an average of two bunches per palm is harvested at each picking. The nuts are usually harvested by means of a bamboo and knife, but on some estates the coolies climb the palms and pick the nuts by hand. When hand-picking is adopted the harvesting coolies clean up the palm after picking the ripe bunches. Under the latter system of harvesting a cooly will pick from 750 to 1,000 nuts per day.

Bamboo picking is usually done on contract at a cost of 50 cents per thousand nuts and a good picker will harvest up to 2,000 nuts per day under ordinary conditions.

It is stated that there is such a variation in the colour of nuts from different palms that colour gives little or no indication of ripeness and nuts from certain palms may be quite green when fully ripe. As a rule the nuts are just beginning to fall when the crop is due to be harvested. The interval of two months between the harvesting periods ensures that the nuts are fully ripe when harvested.

There is a considerable variation in the crops harvested at different seasons of the year and the following table shows the distribution of the crop over the past two years on an estate of over 400 acres:—

Date of Picking.	*1928.*	*1929.*
January ...	139,000	160,000
March ...	261,000	280,000
May ...	399,000	319,000
July ...	278,000	351,000
September ...	296,000	273,000
November ...	206,000	184,000

It will be seen that the heaviest crops are obtained during May and July, which are usually wet months.

Yield of Nuts.

There appears to be a wide variation in both the yield of nuts per palm and nuts per acre on estates in different districts, which may be due partly to differences in climatic conditions, but most probably to variations in the types of soil on which the palms are planted.

The following table shows the average yield of (a) nuts per palm and (b) nuts per acre on the various estates visited. Particulars are also given of the approximate age of the palms and the average annual rainfall on the estates in question:—

Estate.	*Approximate age of palms.* Years.	*Number of nuts per palm.*	*Number of nuts per acre.*	*Average annual rainfall.* Inches.
"A"	25 to 50	49	3,250	114
"B"	15 to 45	72	4,000	90
"C"	35 to 40	67	3,750	82
"D"	25 to 35	68	3,600	95
"E"	50 to 60	60	3,750	80
"F"	20 to 25	72	4,000	80
"G"	35 to 40	58	3,500	55
"H"	35 to 45	85	5,600	56
"I"	35 to 40	65	4,000	45

The distance of planting ranged from 25 ft. × 25 ft. to 27 ft. × 27 ft. square on the different estates.

The following figures show the yield of nuts per acre from the three highest and the three lowest-yielding fields on one estate, which gave an average yield of 5,586 nuts per acre over an area of approximately 1,250 acres during 1929:—

(a) *Highest-Yielding Fields.*

No. 1 = 6,375 nuts per acre.
No. 4 = 6,296 ,, ,,
No. 14 = 6,235 ,, ,,

(b) *Lowest-Yielding Fields.*

No. 9 = 5,146 nuts per acre.
No. 13 = 5,203 ,, ,,
No. 11 = 5,216 ,, ,,

The system of manuring adopted on this estate is to apply 20 lbs. of a complete mixture per palm every alternate year and it is possible that this heavy dressing of artificials may be largely responsible for the phenomenally high yields which are now being obtained.

Preparation of Copra.

In the manufacture of copra it is essential that only ripe nuts should be harvested since immature nuts are known to produce copra of inferior quality.

After picking, the nuts are collected in small heaps of 3,000 to 4,000 nuts, where they remain for a period of three to four weeks in dry weather, which may be extended to five weeks during wet weather. The nuts are then husked in the field and the husked nuts transported either by bullock carts or light railway to a central kiln, where they are made into copra.

The system adopted on one estate was to let out husking, splitting and the whole manufacturing process on contract at a cost of Rs.1.75 to Rs.2/- per thousand nuts. The nuts are counted in the field and again after husking on arrival at the kiln, while a third count is made of the two halves of the kernel after drying is completed.

The common methods of drying the kernels are (a) sun-drying and (b) kiln-drying, but as the former method can only be carried out successfully during continuous spells of dry weather it is only suitable for the dry districts. Consequently, the general practice on most coconut estates in Ceylon is to resort almost entirely to kiln-drying. Under this system, however, it is found necessary to dry the newly-opened nuts in the sun for at least one day in order to get rid of the surplus water which comes from the inside of the nut.

The following is a description of the types of kilns and the methods of drying employed on eight different estates:—

Estate "A".—The kiln is a permanent type of building constructed of brick sides, faced with cement, a corrugated iron roof and concrete floor. The building is roughly 60 feet long by 24 feet wide, giving a drying platform of about 60 ft. × 16 ft. It consists of 5 bays, each about 12 feet long and 16 feet deep, with a verandah of 8 feet wide in front of the platform. Each bay will hold about 8,000 nuts as a maximum, which gives a kiln capacity of 40,000 nuts. It is, however, usually working at a capacity of 20,000 nuts.

The drying platform is constructed of iron girders, carrying wooden joists, spaced about 18 inches apart, over which are placed strips of areca-wood, roughly 1½ ins. × ½ in., as close together as possible. The unevenness of the battens gives ample spacing to allow the heat to pass through to the drying kernels. In addition, No. 3 or 4 gauge wire mesh is placed on top and tied down with wire to prevent small pieces of copra falling through into the firing pit below. It is stated that this precaution saves a loss of about 1½ per cent. of copra. The platform is placed one foot below the top of the front wall, which is 4 ft. 3 ins. above the verandah level.

The firing pit is roughly 4 ft. 6 ins. below the level of the verandah so that the firing floor is about 8 feet below the level of the platform, which is considered the most suitable height. The firing pit is divided by a brick wall so as to form two compartments, one of two bays and one of three bays. Holes, about 3 ft. × 3 ft., at the front of the platform, one in each chamber, allow access to the firing pits, which are connected with the verandah by cement steps. Shallow steps are also placed inside the verandah in front of each bay in order to facilitate placing the nuts on the platform. The lower half of the verandah is built up to a height of about 5 feet, but the ends are left open. The wall at the back of the platform is either pigeon-holed or not, and built right up the eaves to allow fumes and moisture to escape. A shallow jackroof, placed about 6 inches above the main roof, will answer the same purpose.

When the nuts arrive at the kiln they are split in half and providing the weather is dry, placed on a cement barbecue for two days, but during wet weather they are placed straight on the kiln. The opened nuts, which have

been partially dried in the sun, are then placed haphazard on the kiln to a depth of about 12 inches with ordinary crops. When heavy crops are obtained the nuts are stacked 18 inches deep on the platform, but in this case they must be turned twice daily. Under ordinary conditions nuts will remain on the kiln for 4 days. After two days on the kiln the shells are removed and the kernels transferred to the next bay for further drying and so on until the fourth bay is reached, when the copra should be quite dry. The object of moving the kernels to the next section is to ensure evenness in drying.

The firing is done by placing a double row of shells side by side, each shell fitting closely into the next, across the floor of the firing pit. When the nuts have been partially sundried, the double rows of shells are spaced about 6 feet apart on the floor of the firing pit, but during wet weather, when the nuts are placed straight on the kiln, the rows of shells are spaced about 3 feet apart. The shells are lighted at one end so that the fire creeps slowly to the other end of the pit. The shells usually burn at the rate of 8 feet per hour, so that with a platform 16 feet wide one firing will take about 2 hours to complete. Firing goes on almost continuously, a fresh fire being started immediately the nuts have been turned over on the platform.

During windy weather the entrance to the firing pits are covered with sheets of corrugated iron so as to prevent too much draught. It is most important that the shells used for firing should be quite dry so as to produce as little smoke as possible, because if they are wet the smoke will discolour the copra.

When the kernels are quite dry they are transferred to the copra store. This building, which is constructed of corrugated iron, is raised about 8 feet above the ground and has a wooden floor on which the copra is stored until sufficient quantity is obtained to make a consignment. By storing the copra in this way it is kept free from mould.

In dry weather small fires are kept burning at night outside the kilns and copra stores to absorb dew. These fires are lighted early in the evening and early next morning, since little dew falls during the night.

It is considered that small kilns with a platform 40 ft. × 15 ft., placed in fields of 150 to 200 acres each, are preferable to a large central kiln since the former method tends to reduce the cost of transport of nuts.

Estate "B".—The kiln is a permanent structure of steel and brick, faced with cement. The building is roughly 80 ft. × 27 ft. and consists of 8 bays, each 10 feet wide and a platform 11 ft. 6 ins. deep. The firing floor is 6 feet below the platform and the verandah 14 feet wide. One bay will take about 5,000 nuts so that the total capacity of the kiln is 40,000 nuts.

When the husked nuts arrive from the field they are split in half and placed on a cement barbecue for 12 hours in the sun. They are then transferred to the kiln, where they are stacked haphazard to a depth of about 18 inches. Firing is done at night only and double rows of dry coconut shells placed into each other as close as possible, spaced at distances of 3 feet apart, are used for this purpose. Only one firing is given during the night and the shells are removed after the first day's firing. The kernels are then removed to the next

bay and shifted to the adjoining bay each day, the firing process taking 8 days to complete. It is undesirable to have a very high temperature, a steady heat throughout the drying process giving the most satisfactory results.

The kernel is separated from the shell by means of a thin piece of areca-wood about 18″ × 1″ × ¼″ in size, great care being taken to avoid breaking the kernel.

Estate "C".—The kiln is of brick with steel framework, cement/asbestos roof and concrete floors throughout. The loft or platform is constructed of iron girders carrying wooden rafters 18 inches apart over which are placed teak battens, 2″ × 1½″ laid on edge at distances of 1½ ins. apart. There is a space of 7 feet between the firing floor and the platform on which the nuts are placed for drying. The firing pit is divided into three compartments by brick walls. In addition to a six inch jack-roof there are two ventilating holes above the platform on each bay, but none in the pits. This differed from other kilns in having an open verandah on the front.

The size of the platform is 60 feet long and 15 feet wide, which is capable of taking about 16,000 nuts.

The split nuts are placed direct on the kiln and there is no sun-drying. Double rows of coconut shells are placed at distances of 6 to 8 feet apart on the floor of the firing pit. Two rows are connected so that it takes about 4 hours for the shells to burn across the loft and back again. The nuts are then allowed to cool down for 3 hours before giving a second firing and are removed to the next bay before the third firing. After the third firing is finished the shells are removed, care being taken not to break the kernels, and three more firings are given to complete the process. The firing is continued night and day, the whole drying process taking from 3 to 4 days to complete. The copra is then sorted and the raw kernels given an additional firing.

Estate "D".—The kiln is much the same type as those described above. The split nuts are sun-dried on a barbecue for one day and then transferred to a kiln, where they remain for about 5 to 6 days.

Estate "E".—There are two kilns situated in different parts of the estate. When possible, sun-drying is carried out on this estate, otherwise the procedure is one day sun-drying and 4 days drying on kiln.

Estate "F".—The split nuts are placed on barbecue and sun-dried for 1 or 2 days. They are then transferred to the kiln, where they remain for a further 5 or 6 days.

Estate "G".—The split nuts are sun-dried on a barbecue for one day and then transferred to the kiln for 4 or 5 days to complete the drying process.

Estate "H".—Sun-drying is carried out when possible, but when the conditions are unfavourable, the split nuts are dried in the kiln, which usually takes 5 to 6 days to complete.

It will be seen from the above descriptions that, although there are slight variations in the design of the kilns and the duration of firing on different estates, the general principle of kiln-drying is much the same throughout. Further, it is the practice on all estates to keep the two halves of the kernel intact

as far as possible and any small broken pieces are usually removed in the process of grading and sold as a separate grade.

It is generally recognised that sun-drying produces the best quality copra, and whenever the weather conditions are favourable, some estates employ this method of preparing copra in preference to kiln-drying. The process of sun-drying usually takes from 7 to 9 days to complete and it is therefore necessary to provide large cement barbecues for this purpose. The kernels should be covered up at night so as to afford protection from heavy dew, since any dampness on the kernels during the drying process will result in the copra becoming discoloured and mouldy.

Grading and Packing.

When the drying process is complete the copra is transferred to the copra store, where it is sorted into three distinct grades as follows:—

No. 1 grade—Hard, good colour and not transparent.

No. 2 ,, —Soft, and wrinkled on the outside.

No. 3 ,, —Discoloured on the outside, due to immature nuts.

The copra is then packed in bags, each of which contains about 88 lbs., for sale in Colombo.

It is stated that a much better average price is obtained by grading the copra since the lower grades, when separated, realise almost the same price as the No. 1 grade, but if left in the bulk their presence lowers the price considerably.

Yield of Copra.

The ratio of the number of nuts required to produce a candy (one candy = 560 lbs.) of copra varies at different periods of the year. During droughts the nuts begin to fall before they are fully matured so that they are much lighter in consequence. The age of the palm and the fertility of the soil also influence the relative proportions of nuts to weight of copra.

Under ordinary conditions it might take from 1,000 to 1,200 nuts to produce a candy of copra while the average yield of copra may vary from 3 to 4 candies per acre per annum.

The following table shows the average number of nuts required to produce a candy of copra and the average yield of copra on nine different estates:—

Estate.	*Number of nuts per candy.*	*Yield of copra per acre.*	*Yield of copra per acre.*
		candies.	lbs
"A"	1,200	3	1,680
"B"	1,300	3	1,680
"C"	1,341	3 -3½	1,820
"D"	1,287	3 -3½	1,820
"E"	1,100	3¼-3½	1,890
"F"	1,000	3 -3½	1,820
"G"	1,260	3 -3¼	1,750
"H"	1,189	4 -4½	2,380
"I"	1,100	3 -3½	1,820

It is stated that an average yield of 3 to $3\frac{1}{2}$ candies of copra per acre on some of the lighter types of soil can only be maintained by adopting a regular system of cultivation and manuring.

Cost of Production.

The average cost of production of copra varies from Rs. 35/- to Rs. 40/- per candy (560 lbs.), but one estate was actually producing copra at Rs. 30/- per candy.

Prices of Coconut Products.—The price of copra varies from Rs. 60/- to Rs. 65/- per candy (560 lbs.), delivered in Colombo, while fresh nuts usually realise from Rs. 50/- to Rs. 55/- per thousand in the local market.

General Conclusions.

It is well known that Ceylon copra realises a higher price than Straits copra when sold on the European markets. The difference in price may be attributed to the fact that Ceylon copra has not only a better appearence but is stated to contain from 2 to 3 per cent. more oil than the Straits product.

Although copra is sold on its general appearance and not on its chemical analysis, the valuation is based on the fact that good appearance indicates that the copra has been carefully dried and therefore contains a minimum percentage of moisture and a low percentage of free fatty acids.

The method of preparation of copra adopted in Ceylon, which usually consists of one day sun-drying and 5 to 6 days kiln-drying, tends towards uniformity in the product. Further, the use of dry shells for firing produces a steady heat throughout the drying process and prevents the kernels becoming discoloured by smoke, which naturally detracts from the value of the copra.

The grading of the copra according to colour, size and firmness before placing it on the market invariably results in a better average price being realised for the product.

Among other factors which may possibly affect the oil content of the copra are differences in soil and climatic conditions. In this connection it may be mentioned that in Ceylon the palms are planted much closer than is the case in Malaya and they produce a larger number of smaller nuts, which means that it requires a greater proportion of nuts to produce a given weight of copra.

The oil content of the copra may also be influenced by the degree of ripeness of the nuts at the time of harvesting or the period of storing between harvesting the nuts and drying the kernels and both these factors require investigation.

The writer wishes to express his indebtedness to the Proprietors and Superintendents of the various coconut estates visited for the valuable assistance and advice which was so freely given to him in connection with his investigation of the coconut industry in Ceylon.

RECENT FIELD OBSERVATIONS ON RUBBER

BY

F. W. South,

Chief Agricultural Field Officer.

The following general remarks on rubber production during the first five months of the year are summarised from the monthly reports of the Principal Agricultural Officer, Johore, and of the Agricultural Field Officers in the different States of the Federation and Settlements of the Colony.

Prices.

Rough average prices for rubber from small-holdings in dollars per pikul (133⅓ lbs.) have been:—

	Smoked Sheet	Air-dried Sheet	Bark Scrap	Earth Scrap
January ...	—	27-29	—	—
February ...	31-34	27-30	8-10	5- 8
March ...	No	changes	recorded	
April ...	25-28	15-26	8-11	6-10
May ...	20-30	10-27 mostly 25	5-12	5-11

The monthly average price of rubber (per lb.) in Singapore has been as follows:—January, 24.6 cents; February, 26.25 cents; March, 25.43 cents; April, 24.68 cents; May, 23.36 cents.

The price in the country tends to be about two dollars a pikul lower than it is for the same quality in the towns. In Pahang, probably owing to increased transport charges, the price is usually about one dollar a pikul lower than it is in the western part of the Peninsula.

Wintering.

Between the middle and end of January a very well marked and heavy "wintering" commenced almost all over the Peninsula; it continued throughout February and had terminated in most localities by the end of March or the first week in April, though in Pahang West the wintering commenced about two weeks later than it did elsewhere and did not terminate until almost the end of April. The very dry weather during the first three months of the year was

the cause of this very definite "wintering" period, though showers at the end of March in most places and in the second half of April in Pahang West aided considerably the development of the young foliage.

In Province Wellesley, the drought necessitated special precautions on many large estates in order to prevent leaf fires. Such fires occurred on a number of small holdings in Johore during the dry wintering period, but the reports contain no references to any bad leaf fires in other parts of the country.

General Maintenance.

The low price of rubber has had an undesirable effect on the standard of maintenance of many small holdings, comments on this point being made both from Pahang West and from Selangor. In some Districts of the latter State certain holdings are reported to have been abandoned.

On the other hand, in Singapore Island during the May tapping holiday, quite a number of the Asiatic owners of rubber land devoted a certain amount of time and money to such operations as cleaning silt pits and clearing undergrowth from the more heavily overgrown areas. In Malacca also it has been found that routine advisory visits to small holdings by the Agricultural Field Officer and his staff of Malay Officers are yielding results in improved maintenance, better general sanitation and better tapping.

Soil Conservation.

The Agricultural Field Officer, Pahang West, states that undoubtedly more use is now being made by Asiatic planters, particularly Chinese, of a combination of cover crops and terracing and to a less extent of silt pitting as measures against soil erosion on hilly lands. A similar tendency may be observed in other parts of the Peninsula.

It is understood that a soil conservation condition, requiring the construction of silt pits and the planting and maintenance of a cover crop, has been introduced into the titles to all alienated land of a hilly nature in the Districts of Raub and Bentong. A similar condition is likely to be imposed in the case of hilly land in Jelebu District of Negri Sembilan though in the latter district the construction of terraces may also be required.

Catch Crops.

Further areas of bananas have been planted up recently as a catch crop with young rubber in Western Pahang. The market for bananas, however, would appear to be saturated, at least temporarily, and the prices obtained at present are exceedingly low. Ginger is also coming into favour with Chinese small holders in Pahang as a catch crop with rubber although it is not so commonly found as are groundnuts and soya beans.

Tapping and Yields.

In Pahang West the tapping systems most commonly found on small holding are one cut on $\frac{1}{2}$ or on $1/3$ of the circumference of the tree, tapped daily. Bark removal is often heavy, being as much as 2 or $2\frac{1}{2}$ inches a month,

In the more remote localities two or three superimposed cuts are still to be found. The daily tapping of single cuts as described above is probably fairly general on small holdings throughout the country. Tapping on Chinese owned holdings is usually fairly good, but on Malay owned holdings whether tapped by the owner, or by a Chinese on a half share of the latex, deep tapping and wounding are common.

In the first two months of the year the prevailing drought and "wintering" caused a considerable decrease in yield. This, combined with the low market price led to deeper tapping, often accompanied by severe wounding, in an effort to obtain more latex from the trees. The fairly general attempt to obtain increased yields of latex on small holdings took a peculiar form in Penang Island and parts of Johore. The depressing effect of the hot dry weather and warm wind on the flow of latex during the normal tapping hours led some tappers in Penang Island to begin work at 3 a.m. when the maximum humidity is said to occur. They worked by the light of torches fixed to their foreheads. In Johore also the practice of tapping before dawn was adopted on many small holdings sub-let to Chinese. This tapping by insufficient light often led to wounding.

In parts of Pahang West during March, the joint effect of wintering and the long drought so depressed yields that tapping had to be stopped. In the same month it was estimated from field observations that more than half the rubber in Singapore Island was out of tapping. Although the yield of latex improved in Province Wellesley at the end of March after wintering, yet in April it was recorded that many small holders had stopped tapping on account of the low price of rubber, being unable to pay tappers' wages. In the majority of cases tappers' wages had to be reduced.

With a view to restricting output, a few estates stopped tapping as early as March, during the actual wintering period. More general action on these lines, however, was not undertaken until the adoption of the May tapping holiday proposed by the Rubber Growers' Association.

The extent to which both estates and small holdings actually adhered to the scheme for a tapping holiday in the month of May itself appears to have varied somewhat in different parts of the country. It is reported, for example, that in Province Wellesley all estates observed the holiday, while the majority of small holders carried on tapping vigorously. In Southern Perak, morning rain in the early part of the month made tapping impossible, but apart from this a number of European estates continued to tap as usual and little difference was noticed in the amount of tapping done by Asiatics. In Pahang West, the majority of the Chinese holdings of 50 acres or upwards, of which the owners were probably in the main members of the Asiatic Planters' Association, together with the majority of European estates were out of tapping throughout the month. Certain European estates were, however, out of tapping for one week only. No attempt was made to organise the small holders as was done in some of the Western States and Settlements. In Singapore, on considerable areas, including quite a number of small holdings, the tapping holiday was

observed. It was, however, noticeable during the last week of the month that some small holdings were recommencing tapping owing undoubtedly to lack of funds which prevented the owners from holding out for the full month. Lack of funds probably operated against the observance of the tapping holiday by many Malay small holders all over the country.

Budded Rubber.

Imports of budwood, budded rubber and rubber seeds from the Dutch East Indies still continue in large quantities. The amounts arriving during the first five months of the year were:—23,591 metres of budwood, 40,602 budded stumps and 95,000 selected seeds.

While the great bulk of this material has been imported for European owned estates all over the country, the records show that a few consignments have been sent to three privately owned Chinese estates in Selangor, Johore and Kedah. Other records of the interest of Chinese owners in this method of obtaining increased yields are supplied from Batang Padang District of Perak and the Raub District of Pahang. In the former area a local Towkay is enthusiastically carrying out a budding programme on his estate with budwood grown in Selangor, while in Raub District a Chinese owned estate of 400 acres of trees from 18 to 24 months old was budded with the Selangor clone Sungei Reko No. 9 and a 70% success was obtained from the first budding.

It may be mentioned in passing, that in order to meet the increased interest in budding evinced by Asiatic rubber planters, a full account of the technique of budding, written by Mr. Mann of the Rubber Research Institute, is being prepared for publication in the next number of the Malay and of the Chinese Agricultural Journal.

Three estates in Selangor are now exporting budwood and budded stumps of their best clones to British North Borneo, Ceylon, Burma and the Netherlands East Indies. The quantities exported during the first five months of the year were:—140 metres and 285 yards of budwood and 2704 budded stumps.

Manufacture.

A certain number of estates continue to make sole crepe which has commanded a premium of about 8 pence per lb. over the current market price for smoked sheet.

One estate in Johore commenced to export Revertex in February.

Some years ago alum was a popular coagulant on small holdings. Owing, however, to its harmful effect on prepared rubber, steps were taken to prevent its use. Recent enquiries show that, except in one or two remote localities in Kedah and Kelantan, it is now rarely to be found on small holdings and that acetic acid is the one coagulant now generally used.

Most Malay owners of small holdings prepare their rubber in the form of air-dried sheet. In some localities, however, they make smoked sheet, as for example in the holdings around Pekan on the east coast of Pahang where they are reported to produce smoked sheet of very fair quality. Chinese small

holders, on the other hand, usually make smoked sheet and a number undertake to smoke rubber for their Malay neighbours at a price of one cent a sheet. While this method of dealing with his rubber may often commend itself to the Malay owner, he is, nevertheless, liable to become the victim of fraud. An instance of this occurred in Selangor where the Malays suddenly discovered that they had been cleverly swindled for years by the local smoke-house proprietor. The latter purposely manufactured smaller sheets from the latex derived from his own trees and delivered these when smoked to his clientèle, retaining as his own the larger sheet brought to him for smoking. It is understood that the Malays in this vicinity have recently co-operated to provide their own smoke house.

Two Co-operative Societies have been formed among Malay owners of rubber land in Selangor for the purpose of erecting jointly owned factories and smoke-houses to treat the latex belonging to the members, and so to ensure a better quality product. This will not only command a better price on account of its superior quality, but being produced in considerable quantity, can be sold direct to a large dealer, so that the profits of the lesser middlemen are saved for the owners. The factories for these two Societies are in course of erection under the supervision of officers of the Co-operative Department who also obtained for the Societies plans of a suitable type of factory and smoke house. It is expected that one of these Co-operative factories will be ready to commence working in June.

The initial steps in the formation of these Societies have to be made very carefully and thoroughly, so that the members fully understand the method by which the capital required is raised and the system on which the factory will be operated and they themselves will receive payment for their produce. Progress is, therefore, slow at first, but if the two factories now under construction prove successful in operation, it will be possible somewhat more rapidly to found and equip other societies in the same way. There is already a demand for such factories and smoke houses from several groups of Malays, each group owning a sufficient area of rubber holdings to provide the necessary supply of latex.

Diseases and Pests.

The long period of dry weather had a beneficial effect in decreasing very noticeably the prevalence of the diseases caused by fungi which depend for their active growth on moist conditions, such as Mouldy Rot and Black Stripe of renewing bark and Pink Disease on branches and stems. All such diseases, where they have occurred, have been kept under satisfactory control without much difficulty. During recent months there has been a marked increase in the number of small-holders who voluntarily undertake preventive painting at regular intervals to control Mouldy Rot disease. Many of these owners have now come to realise that if they carry out preventive painting regularly, it is usually unnecessary to order them to stop tapping their trees and that in consequence, they are far less liable to incur the loss involved when their untreated

trees have become so badly diseased that cessation of tapping becomes an essential item of any really effective treatment.

While the dry weather and heavy wintering had their beneficial effect in the control of the diseases mentioned above, they were not without an accompanying harmful side which was chiefly manifested as regards diseases in two ways. On many small holdings in Johore and elsewhere the damage already caused by excessively deep tapping was accentuated by sun-scorch, now well recognised as a form of damage frequently experienced when the absence of leaves on the trees exposes the thin renewing bark to the direct rays of the sun.

The other form of disease encouraged by the dry conditions was secondary leaf fall caused by the fungus *Oidium Heveae*. This disease was found to be prevalent in parts of Southern Perak, Selangor, Negri Sembilan, Malacca and Northern Johore on the young leaves and flowering spikes of the rubber trees as they emerged at the end of the wintering period. This fungus in Malaya appears to be dependent on dry conditions for its active spread; it gradually disappeared with the advent of more showery weather at the end of April and the beginning of May and ceased to be in evidence after the young leaves had developed sufficiently to withstand its attacks. An account of this disease has already been given in the June number of the *Malayan Agricultural Journal*, Vol. XVIII, p. 306.

In the holdings around Pekan on the east coast of Pahang, a species of cicada did some damage to rubber trees and a number of other plants during March by laying its eggs in large numbers in the tender bark of the young green shoots.

During February, when the trees were bare of leaves, it was noticed that a species of mistletoe was frequently to be found on rubber trees in Negri Sembilan and also more occasionally in Selangor. Advantage was taken of the season when it is most conspicuous to give orders for its removal.

In conclusion, reference may be made to the very interesting and instructive series of exhibits shown by the Rubber Research Institute at the Malayan Agri-Horticultural Association's Exhibition in Kuala Lumpur on April the 19th to 21st. The main points illustrated by the exhibits were Budding, Preparation of Rubber, and Diseases. Demonstrations of the technique of budding were given at intervals throughout the three days and were very well attended. Special talks about the exhibits were given in Malay on the 20th and 21st early in the morning before the Exhibition was open to the public, to the delegates of Rural Credit Co-operative Societies who were attending a Conference in Kuala Lumpur, and to parties of Malay village headmen. Leaflets in Malay on the various exhibits were distributed to those attending these special demonstrations, while supplies of the leaflets in both English and Malay were available for all members of the public.

CULTIVATION OF WET RICE UNDER IRRIGATION IN AUSTRALIA

BY

J. W. Jolly,
Agricultural Field Officer,
Singapore.

During a recent visit to Australia, the writer was able to visit and to inspect the Murrumbidgee Irrigation Area, New South Wales, where, during recent years, the cultivation of rice under irrigation conditions has been meeting with increasing success as is shown by the fact that whereas in the 1924—25 season the planted area was 157 acres, in 1928—29 it had increased to 14,319 acres.

The following figures show the annual increase in planted area up till 1929.

Season.	Acres.
1924—25	157
1925—26	1,978
1926—27	4,772
1927—28	12,080
1928—29	14,319

It is estimated that the planted area for the 1929—30 season exceeds 19,000 acres.

For the season 1927—28 with 12,080 acres under cultivation, the total yield was 19,130 tons, or the equivalent of 5,739,000 gantangs, equal to an average yield over the whole area of 457 gantangs of padi per acre. It was stated that crops up to 5 tons padi or approximately 900 gantangs rice per acre have been harvested and that a yield of 3 tons padi or approximately 540 gantangs rice is not unusual.

The 1928—29 crop had been harvested just prior to the writer's visit, so that he was only able to observe the padi in its early stages of growth.

It is claimed that rice has been grown on some of the poorest classes of land in the district with most satisfactory results. Throughout the Murrumbidgee area there is a considerable amount of heavy clay loam overlying a stiff clay sub-soil. Prior to being utilised for the cultivation of rice, this land had proved practically useless for the production of other crops, but since the establishment of padi cultivation quite remunerative crops of both wheat and oats have also been obtained from the land

The successful cultivation of rice is dependent largely upon:—

A. High temperatures during the growing period.

B. A reliable water supply.

C. Soils that are comparatively flat.
D. Good surface drainage.
E. Freedom from water weeds.
F. Dependable seasons.

With the exception of the problem of weeds, these desiderata are fully met in the area in question. The temperature is particularly suitable, readings as high as 110°F often been reached.

Preparation of the Land.

For the cultivation of rice, it is necessary that the land be practically level. Where this is not the case, grading is rendered essential. If the contour of the land is such as to demand heavy grading, areas result on which the top soil is lost, producing harmful effects to the crop. Instances of this were pointed out, but apparently they are rather the exception than the rule as, up to the present, sufficiently flat land has been available.

It is the practice to contruct extremely large check banks (bunds) owing to the porous quality of some of the top soil and also the rather great depth of water which it is the practice to utilise. These banks should in all cases be constructed some time previous to planting, in order that they may have sufficient time to settle and become more impervious to water. Furthermore, it is often necessary to raise these banks just prior to planting owing to the fact that they have settled considerably since construction; this operation would be most difficult and expensive if carried out after planting when the water is on the bay.

In the construction of check banks, furrows are struck out leaving an unploughed strip of 6 to 8 feet in the centre. This strip thus forms a solid foundation for the check bank. The ploughed soil is afterwards thrown in from each side with a "delver", and the process of alternately ploughing and delving continued until the bank is sufficiently high. This operation, after grading, is considered to be one of the most important and may be directly responsible for the resultant success or failure of the crop.

The size of the bays depends largely upon the contour of the land; the most convenient and easily controlled are found to be from 5 to 6 acres. Long narrow bays running in the same direction as the prevailing winds have been proved to be disadvantageous as the water often becomes so choppy as to damage severely plants in the early stages of growth.

The form of cultivation and method of sowing are very similar to those in practice for the cultivation of wheat, i.e. ploughing, cultivating, harrowing and drilling. Two exceptions worthy of note are concerned with the depth of ploughing and the method of sowing. Ploughing to a depth of only three inches is the usual practice; this is often carried out with a 12 disc cultivator having adjustable discs. In sowing, the hoes are removed from the drill thus allowing the seed to fall on the surface of the ground, the drill is then followed by harrows which cover the seed to some extent. The removal of the hoes is rendered

necessary by the fact that owing generally to the sticky nature of the soil, the hoes and connecting pipes to the drill continually become blocked and thus render the sowing very uneven.

Sowing.

It is considered that the best time for sowing is as soon as practicable after all danger of frosts has passed, but a little time must be allowed in order that the water temperature may be slightly raised. It is imperative that sowing should be completed as early as practicable for the following reasons:

A. Early sowing enables the longer maturing varieties to be sown. These varieties are the heaviest yielders, best stoolers and require less seed per acre.

B. In order that the crop may mature and be harvested before the commencement of the rains. This is a most important point to be considered where it is necessary to get heavy machinery on the land.

On the Murrumbidgee Irrigation Area, sowing should be commenced at the end of September or early October, seed being sown at the rate of 90—110 lbs. per acre.

Immediately on completion of sowing operations, the land is well moistened with irrigation water to assist germination; this is followed after about a week by a second watering, care being taken that the soil does not in the interval become so dry as to cake, otherwise the young plants will be severely damaged. The young plants are kept irrigated in this manner until they attain a height of approximately 6 inches, after which the water is allowed to remain on the area. The depth of water is thereafter gradually increased as the plants grow until a depth of one foot of water is attained. Water is retained on the bays at this depth until the last of the grains are out of the 'milk stage'.

It has been found unnecessary to change the water in the bays during the period of growth, but frequent waterings are essential in order to keep an even water level and replace heavy losses due to evaporation, transpiration and seepage.

The operation of draining off needs care and is usually extended over a period of 4 to 5 days; this has been found essential as any sudden removal of the water results in the lodging and consequent loss of a large percentage of the crop.

In the early stages of growth, hand weeding is practised to some extent, but the difficulty of labour is greatly against this method.

Harvesting.

Harvesting is undoubtedly the most risky operation which has to be carried out as any sudden break in the weather prohibits all use of heavy machinery. Wet conditions have been experienced during harvest with a resultant heavy loss of grain. Later plantings are generally the most seriously affected by adverse weather conditions at harvest.

Two types of machines are in use for harvesting, the "Reaper and Binder" and the "Header". Both machines should be fitted with auxiliary motors, $3\frac{1}{2}$ h.p. for the binder and 7 h.p. for the header; this will lessen the dragging power required and give more efficient results.

The "Header" is proving the more satisfactory and efficient method of harvesting as, once the grain ripens, time is of vital importance. This machine turns out the grain ready for bagging in the one operation, but it is imperative that the crop should be of an even ripening otherwise a poor sample will be obtained.

When using a binder, harvesting should be commenced a week earlier, as should the crop be at all overripe, a large percentage of the grain will become beaten out and lost. The disadvantages of this machine are mainly that it is slower, the sheaves have to be stooked for at least two weeks, carted and either stacked or threshed, a considerable loss of grain occurring at each handling; furthermore, the operation of binding and threshing has been found to be more expensive.

Weeds.

Weed growth is the most serious pest with which rice-growers have so far had to contend, for the soil and climatic conditions are such as to be eminently favourable for the growth of all water grasses, rushes and weeds. If weeds are allowed to grow unchecked they quickly take control and render the land entirely useless for the cultivation of rice or any other crop.

Over-cropping has been found to encourage the growth of weeds; therefore rotation has been adopted as a check measure, the following being one recommended—

Rice, winter fallow, wheat, short fallow, winter legume, short fallow.

The rice is sown in October and harvested in April or May. The land is then winter-fallowed and an early maturing variety of wheat sown in April or May and harvested in December. The land is then short-fallowed and a crop of winter legume sown and grazed off by sheep. The land is then ploughed in August and given a short fallow previous to sowing again with rice, in October.

For the present, shallow ploughing has been advocated in order that the weed seeds may be kept as close to the surface as possible, thus rendering control more simple.

During the short period that rice has been under cultivation in this area it has been found impossible to obtain anything like a satisfactory yield from two successive crops of rice; in every case the second crop is almost, if not completely, smothered out by excessive weed growth.

Fertilisers.

Up to the present, fertilisers have not been applied, but it is realised that owing to the exhaustive feeding of the crop if land is to be continually cropped, some form of fertiliser will become necessary.

Costs.

No definite figures as to cost of production are available to the writer, but it may be accepted that the cost per acre up to and including harvesting is approximately the equivalent to the present prices of one ton of padi i.e. £10—£11.

Production.

In Australia, up to the present time, production of rice has not exceeded consumption which is estimated at 25,000 tons annually. If, however, the cultivated area increases at the present pace it will soon become necessary to obtain an outside market in order to retain a satisfactory price. The yield for 1928—29 was in the vicinity of 21,000 tons; this figure is likely to be exceeded in the coming season, as a larger area has been planted.

Varieties.

Two varieties of rice are cultivated, both of which have been imported from California, namely "Caloro" and "Colusa".

Caloro is a variety developed in California which had previously been imported from Japan. It is erect and vigorous in growth, attaining a height of about three and a half feet; is a fair stooler, with fairly coarse strong stems and is not apt to lodge. This is the standard variety grown; it is known as a good yielder, does not easily shatter and appears to do well on a wide range of soils. It matures in 180—185 days.

Calusa. The growth is erect but not very vigorous and rather short, reaching a height of three feet only. It is an average stooler and rather inclined to lodge. It matures in 170—175 days.

The writer is indebted to the kindness of officers of the Department of Agriculture, New South Wales in permitting a visit to this irrigation area; and especially to the Agricultural Inspector of Leeton, New South Wales for supplying all the information contained in this article.

Abstracts.

MARKETING PROBLEMS OF COCONUT GROWERS.*

In view of the unsatisfactory state of the existing system for marketing copra in the Philippine Islands, it should be reorganised on the basis that the problems of marketing and distribution are as much the concern of the producer as of the trader.

The small holders, who supply not less than 80 per cent of the copra, are completely in the hands of the rural middlemen. Among these local dealers, it is the common practice to advance money to the growers at onerous terms, so as to leave them always more or less in debt, and then to keep forcing down the prices and undervalueing and undergrading copra to the disadvantage of the helpless debtor-planters and of the coconut industry as a whole.

The rural buyers form the first link in a chain of intermediaries through which the copra passes on its way to the consumer, with the result that the grower receives a smaller return for his labour and the consumer is forced to pay unnecessarily high prices because each middleman in turn has to receive a sufficient margin of profit.

The grading of copra for sale to the Philippine crushers is based on a range of seven ill-defined groups based on moisture percentages and ranging irregularly from 4 per cent to 19 per cent; and for the export trade, on four grades based on appearance and origin. These systems are very unsatisfactory as besides being ill-defined they leave the valuation of copra to the whim of the buyer, and furthermore, the various grades have no legal standing for contract purposes.

The growers have at present no information as to the trend of prices, but with such information they would be able to market their produce intelligently and not be so completely in the hands of the buyers who have better information. The individual planter working alone cannot successfully market his produce to the best advantage as he is too weak to influence market developments, and he cannot establish and develop his own marketing system so as to obtain the highest return possible. Further, the producer lacks the facilities and the time needed to obtain information concerning crop and market conditions.

The Philippine Legislature recently passed the Co-operative Marketing Law which provides for the organisation of a co-operative marketing association. The Bureau of Commerce and Industry has been entrusted with the functions of establishing local associations under this law.

* Abstract of a speech delivered before the First National Congress of Coconut Planters held at Manila on February 21st, 1930 on "Market Problems of Coconut Growers" by Cornelius Balmareda and published in Commerce and Industry Journal, Vol. VI, No. 3, March 1930.

The benefits which will be derived from these are as follows:—

1. Copra drying centrals would be established where modern driers would produce a uniformly high grade of copra which would command higher prices.
2. The local associations would sell the copra collectively and so obtain better prices.
3. The local associations would finance the growers and approve loans on reasonable terms.
4. The local associations would obtain reliable information on crop and market conditions from headquarters for the guidance of their business.
5. Fixed uniform copra standards would be established to improve the quality of Philippine copra and facilitate trading.
6. A Copra Produce Exchange could be established at Manila to provide an outlet for copra shipments from provinces, where no local associations exist, and to absorb the surplus copra from local associations.
7. The practices and usages of the trade would be standardised for the more speedy and orderly transaction of business.
8. Assistance would be given in the development of established markets, and systematic advertising would develop new outlets for the improved products of the Association .

The proposed methods of marketing are of interest:—

Local Auctions.

The various consignments of copra will be delivered by the producers to the local association to be arranged for inspection by the bidders. Written bids will be deposited by the prospective buyers into boxes provided for the purpose on the auction days fixed by the Association, and at a certain hour the boxes will be opened in the presence of bidders and sellers. The bids will be read and recorded and the lots sold to the highest bidder provided that the seller is satisfied with the bid. Successful bidders will be required to make a deposit and pay the balance within three days or be liable to demurrage. Should a bidder later refuse to take delivery he will forfeit his deposit.

The expenses of the auction will be shared pro rata by members, and non-members will be charged at a fixed rate per picul sold. Every seller will guarantee his consignment as of correct weight and define its quality. A penalty will be imposed for faulty declaration.

Central Copra Exchange.

This would make possible the meeting of big buyers and sellers at regular intervals; it would regulate the consumption of stocks and tend to stabilise prices. This proposal could later be extended to deal with other major crops and such a Produce Exchange would then be in constant activity.

The Exchange will afford a means whereby grading can be originated for the information of local associations. The existing absence of organised grading offers no inducement towards the production of high quality copra. On the contrary, it is not in the grower's interest at present to make additional effort to improve his copra as the price will remain unaltered.

REPORTS OF THE IMPERIAL ECONOMIC COMMITTEE, FOURTEENTH REPORT.

A SURVEY OF THE TRADE IN RUBBER MANUFACTURED GOODS.

This Report, which is published by His Majesty's Stationery Office, London, (Price 6d. Net), consists of 119 pages, and is divided into thirty chapters and seven appendices.

The Imperial Economic Committee was appointed by the Governments of the United Kingdom, the Dominions, India, and the Colonies and Protectorates acting under a Resolution of the Imperial Conference of 1926.

The Report contains a valuable survey of Empire Trade in rubber manufactured goods which is of interest to producers of raw rubber as well as to rubber manufacturers.

The Committee emphasises the difficulties experienced in presenting comparisons of statistics of production owing to the rapidity of advance of the industry and the lack of satisfactory statistics of production of rubber goods in certain countries.

As the Committee states, the rubber manufacturing industry is frequently considered to be synonymous with the tyre industry, but this is only justified by the fact that 75 per cent of the raw rubber produced is absorbed in the manufacture of tyres.

Varieties of Rubber Articles.

Rubber is, however, used in the manufacture of many different articles which cannot be classified as rubber goods, including the following articles:—

(1) Tyres (solid and pneumatic) and tubes.

(2) Mechanical goods—belting, hose, tubing, valves, washers and packing.

(3) Footwear—boots, shoes, soles and heels

(4) Miscellaneous:—Water proofed goods—apparel and fabric. Surgical and hygienic—surgeons' and other gloves, syringes, douches, hot water bottles, sponges, water and air beds. Sports goods—golf, tennis and football and bathing caps.
Toys—balls, dolls, models, aquatic toys and balloons.
Rubber thread for elastic webbing.

Stationery—rubber bands and erasers.
Hard rubber goods (vulcanite or ebonite)—for electrical apparatus, telephones, switchboards and wireless, fountain pens and parts of surgical and hygienic appliances, such as nozzles, stoppers and handles.
Electrical insulation—cables and wires.
Noise and vibration insulation—shock absorbers on railway and motor vehicles, aeroplanes, road surfaces.
Floor covering and matting—in buildings, cars, ships and aeroplanes.
Decorative purposes—artificial flowers, ornaments.

The Committee refers in a later section to comparatively recently evolved types of manufactured rubber articles, viz. hard rubber linings for containers for chemicals and soft rubber linings for grinding apparatus and mining machinery.

In some of the above articles, e.g. tyres and tubes, rubber forms a large proportion of the article; while in others, e.g. water-proofed fabrics, the amount of rubber is small.

On this account, it was found essential to deal with the trade statistics in sections. Another important consideration is that the rubber industry depends to a great extent on other industries.

The Tyre Industry.

Tyre manufacture in countries in which the motor car industry is rapidly extending have an advantage over those in which progress is not so rapid. This is particularly noticeable in America, which during 1926—1928 possessed more than 78 per cent of the registered motor vehicles in the world, while the American share in the production of such vehicles during this period averages about 83 per cent of the world's production.

Another important point which is emphasised in relation to tyre production is that large scale units are required for economic production, so that the number of firms competing for world trade is few and international in character.

Competition in international trade in tyres is between seven large companies, one British, one French and five American. A number of factors, including tariffs, affect the flow of imports and exports from the different countries.

The organisation required for the sale of other kinds of rubber goods, which are sold to other industries, differs considerably from that required by tyre manufacturers owing to the numerous factors involved. On this account, the growth of the rubber producing industry and the absorption of raw rubber by industry in the chief manufacturing companies affords the only means of of measuring the progress of the industry as a whole.

History of Rubber Production.

The rubber manufacturing industry was a comparatively unimportant industry until the development of cycling and motoring in 1900. In that year,

the total world's supply of raw rubber was about 40,000 tons and included only 4 tons of plantation rubber, whereas in 1928, the production of plantation rubber was over 600,000 tons and the production of wild rubber had fallen to less than 30,000 tons. In 1929, the figures are respectively about 835,000 tons and 25,000 tons.

Of the amount consumed, the United States used over 58 per cent in 1929, while the United Kingdom is a bad second at approximately 9 per cent. About 96 per cent of crude rubber is absorbed by the industries of 10 countries.

Uses of Rubber in Different Branches of the Industry.

Raw rubber is absorbed in the various branches of industry in very different proportions in different countries, but figures based on manufacturers' returns are only available for the United States. In the United Kingdom, it is estimated that 75 per cent of raw rubber is absorbed by the tyre industry and the remainder is equally divided between mechanical goods; waterproof garments and footwear; sports, surgical and hard rubber goods; insulation of wires and cables and elastic for the textile industry.

In 1928, figures published for the United States show that more than 85 per cent of the rubber absorbed in the industry is used in the manufacture of tyres and tubes.

Reclaimed Rubber.

The production and use of reclaimed rubber is most extensive in the United States.

In 1928, 150,000 tons of reclaimed rubber were used in addition to 440,000 tons of raw rubber. Reclaimed rubber is absorbed largely in the manufacture of hose and packing, matting, footwear and hard rubber goods. Apart from being economical in price it is considered more suitable than raw rubber for certain purposes.

Mechanical Rubber Goods.

Next, but a poor second to the tyre industry, is the manufacture of mechanical rubber goods—which include driving belts, hose, valves, packing, various shock absorbers and other rubber goods used in connection with machinery.

Nearly 80 per cent of belting in international trade is exported by four countries of which the United States is the chief exporter and the United Kingdom the second. In belting and hose combined—the only two sections of mechanical goods for which comparable trade statistics are available—the United States and the United Kingdom occupy respectively first and second places.

Rubber Footwear.

The rubber footwear industry is the third largest absorber of raw rubber, The chief producing countries are the United States, Canada, France and the

United Kingdom, while it is of interest to note that Japan and British Malaya compete largely in the Far East for the cheaper kinds.

In connection with rubber soles and heels, however, the centres of the manufacturing industry are not confined to a few countries. This is probably due to the comparatively small amount of skill and the comparatively low cost of machinery required for production.

The Industry in Different Countries.

Although it is not possible in a short review to give many details, it is of interest to note the rapid advance in the consumption of raw rubber in the United Kingdom from 29,000 tons in 1923 to 72,000 tons in 1929. The position of Canada as the fifth rubber manufacturing country in the world is also of interest.

Rapid increases in production of rubber goods are also taking place in France, Germany, Japan and Belgium.

The Committee, however, emphasises the need for more uniform statistics for a proper appreciation of the economic changes and possibilities in the Empire.

Technical Skill and Labour.

Standardisation.

The difficulties involved in the treatment of rubber and the necessity of research into the fundamental principles on which such treatment depends is emphasised.

It is only during the last 20 years, as the reviewer of this article pointed out in 1913, that the rubber industry has changed from traditional rule of thumb methods to scientific control.

Much of the labour required in a rubber manufactory is skilled and labour charges therefore figure largely in production costs of even the most up-to-date factories—a point which is frequently overlooked by those who clamour for new uses.

Another important problem, especially in the manufacture of tyres, is that of standardisation. Although considerable advances have been made, it must be realised that car manufacturers frequently alter their designs and the tyre manufacturer is therefore dependent on these changes, since old types of tyres have to be supplied for a long time for cars already in use. This necessitates the maintenance of a large number of types of moulds, e.g. over 150 different types are required to meet demands in the United Kingdom. In the case of general rubber goods, standardisation has been prevented by the demands of the purchasers and also the conservation of the old established firms making such goods. This lack of standardisation results in uneconomical methods of production.

Three very interesting examples of this are given, viz.

(i) The demand of every marine engineer for a different colour of the rubber used in packing the joints of engines.

(ii) The manufacture of 50 different sizes of belts for driving motor cars, all within about 1 millimetre of each other in size and with little difference in shape.

(iii) The number of varieties of rubber boots and shoes of four firms in the United States amounts to 77,000.

It is, however, not possible to generalise on standardisation, since (1) the rubber manufacturing industry is catering for other trades: (2) in the manufacture of finished articles (footwear, sports goods etc.) brands and trade names have been established: (3) production of cables and elastic thread in which the rubber forms only a portion of another article.

There is, however, a distinct move towards greater standardisation, which is being supported also by the industries using the particular article and which is resulting also in the production of an article of better quality.

It is also hoped, through the efforts now being made, that all Government supplies in the United Kingdom will be based on agreed specifications. Committees have also been formed to consider standard specifications for rubber proofing for balloon fabric, rubber flooring, ebonite for panels in wireless and electrical insulation.

In the United States the Bureau of Standards has drawn up 71 specifications in relation to rubber packing, hot water bottles, rubber cement, rubber hose, matting and floors.

The recognition of such standards and specifications throughout the Empire is considered by the Committee to be important in relation to its influence on Inter-Imperial trade. Standardisation would also lead to simplification in costing and the existence of a "hall mark" for such standards would protect customers.

The chief difficulty in fixing minimum prices for a minimum standard of quality is on account of continental competition where wages are lower and the quality of the goods is often inferior, with the result that they sell at cheaper prices.

Minimum prices for lowest quality for certain rubber goods and an international price convention are already in operation and have already proved of benefit to the industry and checked the lowering of quality resulting from excessive competition.

Research.

The Committee remarks on the fact that a number of the larger and more progressive units of the rubber manufacturing industry maintain development sections which devote their time to the study of new materials, special factory processes and new applications and uses of rubber.

Reference is also made in this connection to the formation in 1920 of the Research Association of British Rubber Manufacturers,

Tendencies in the Industry.

The expansion in the production and uses of rubber during the present century has been phenomenal, but the prosperity of the motor industry dominates the situation not only directly but indirectly by its effect on the price of raw rubber for other uses.

There is little doubt, as the Committee states, that stability of price of raw rubber is in the interest of both the producer and user. Efforts for closer co-operation both on the selling and manufacturing sides are desirable, although this does not apply to the tyre industry which is already concentrated in a few powerful hands.

It is considered that the concentration of factories into larger units, the the conduct of research, the distribution of information and the establishment of recognised grades and standard specifications would considerably benefit the industry.

Appendices.

The report concludes with seven appendices, which include the following interesting sections:—

(1) The Development of the Plantation Rubber Industry.
(2) International Trade in Reclaimed and Scrap Rubber.
(3) Note on the Official Statistics.
(4) Statistical Tables.
(5) Leading Canadian Rubber Manufacturing Companies.
(6) Information re wages and hours of work of rubber workers.
(7) Research Organisations.

A more detailed study of this publication will repay all those who are interested in the rubber industry and its perusal is especially recommended to the producers of raw rubber and should help them to realise the difficulties involved in connection with new uses and applications.

B.J.E.

Reviews.

A Preliminary Account of Three Rice Stem Borers.

BY

H. T. Pagden.

Special Bulletin; Scientific Series No. 1, Department of Agriculture, S.S. & F.M.S. 30 pp. 1 plate in colour and 7 line drawings. Federated Malay States Price 50 cents (Straits Currency) Post Free.

The occurrence of stem borers is one of the limiting factors of importance in the production of padi. The author describes three pests: *Diatraea auricilia* Dudg., *Schoenobius incertellus* Walk., and *Sesamia inferens* Walk.; also notes are given on *Trichogramma nanum* Zehn., an insect which is found parasitic on the eggs of the above pests. In addition to the valuable data given on the life history of these pests, it is particularly interesting to note the growing attention which is being given to the study—and if necessary the breeding—of parasites in an attempt to control padi borers.

A considerable amount of work has been performed on stem borers of padi in other rice-producing countries, notably in Japan and Java, but Mr. Pagden's monograph is the first published account of such pests in Malaya. The information here recorded marks a distinct advance in our knowledge of these insects, and is a preliminary to the more complete information which is essential before effective methods of control can be put in action.

D.H.G.

Report on the Administration of the Malayan Information Agency for the Year 1929.

F.M.S. Federal Council Paper No. 13 of 1930.

The Malayan Information Agency of 57 Charing Cross, London, in its Annual Report for 1929 gives a brief history of the Agency since its inception in 1910, followed by an interesting account if its activities during the year 1929.

The work of the Agency falls naturally under two headings—information and publicity. Necessarily these two duties overlap, but a perusal of the report must convince the reader that the work has been well systematised.

Space forbids of a detailed review of the methods adopted by the Agency to make Malaya more familiar to the people in the United Kingdom, but the following figures regarding the work in 1929 will indicate the diverse nature of its duties. Enquiries—(personal, by letter &c.) over one thousand; by telephone, over eight thousand; Publications—17 kinds for sale, over 1,000 sold. Agency publications brought up-to-date and many distributed. Reading Room and Library—well patronised. Exhibitions—the Agency took part in five major

exhibitions and gave assistance at numerous minor exhibitions. Malayan films were shewn at the Imperial Institute Cinema and the North-East Coast Exhibition Cinema at Newcastle. Malaya was advertised in the Press. In addition, contribution of articles to the Press numbered 390. The large collection of lantern slides was revised and re-classified. These slides are available to lecturers. During the year 341 lectures were given with the aid of Agency slides.

The work of the Agency in 1929 towards promoting the agricultural prosperity of Malaya has been noteworthy. In addition to rubber, the pineapple industry in particular has been singled out for special propaganda. At the five big exhibitions in the United Kingdom the use of Malayan pineapples was popularised by attractive exhibits, by demonstrations of cooking and by the sale of a booklet on Pineapple Cookery Recipes. The increase in consumption of Malayan pineapples—from 46,000 tons in 1928 to 56,000 tons in 1929 must be due—at least in part—to the successful efforts of the Agency.

Necessarily, it is difficult to gauge the usefulness of the work performed by the Agency. Yearly, the demands of the Public on the time and resources of the Agency increase, which indicates that the information at the command of the Agency and the assistance they give is receiving ever wider recognition.

D.H.G.

Annual Report of the Department of Agriculture, Straits Settlements and Federated Malay States, for the year 1929.

BY

H. A. Tempany, D.Sc., F.I.C., F.C.S.,

Director of Agriculture, S.S. & F.M.S.

Supplement to the F.M.S. Government Gazette, June 6, 1930, pp. 19, Price 25 cents (Straits Settlements Currency), Government Printing Press, Kuala Lumpur.

This report comprises a concise general review of agricultural conditions in Malaya during 1929 followed by a summarised account of the principal activities of the Department of Agriculture during the same period.

In form it differs somewhat from its predecessors in that the two subjects are treated separately, Part I of the report giving a description of agricultural conditions in Malaya and Part II an account of the work of the Department including summaries of the reports of the various divisional officers.

It is necessarily difficult in the compass of nineteen pages to do more than give a broad outline of the numerous subjects treated and to indicate the lines along which the work is organised. This is especially the case in view of the considerable extensions which are at present taking place in the activities of the Department. In these circumstances it has been arranged to issue the detailed reports of heads of divisions in bulletin form.

Those who desire to obtain a concise conspectus of the position will, however, find the report to be of considerable utility. Copies can be obtained from the F.M.S. Government Printer on application, price 25 cents.

D.H.G.

Miscellaneous.

AGRICULTURAL SHOWS IN JULY, 1930.

Kedah State Show.

The Kedah Agricultural Show was held in the English School, Alor Star, Kedah on July 10th and 11th, 1930. Competition in the Fruit Section was poor, but in all the other agricultural classes it was keen. Generally the classes were fully representative of the best in the various districts of the State.

Kedah contains many village industries; classes were provided for all of these and were well supported. The Kedah Government rightly considers that the encouragement of village industries is of great importance in connection with native agriculture. The Show demonstrated the growing improvement in workmanship and in particular, that the workers pay more attention than formerly to the question of utility of the objects they make.

The Department of Agriculture, S.S. & F.M.S., staged an exhibit, further particulars of which will be found under "Departmental Notes" in this issue.

The usefulness of this Show for demonstration purposes is undoubted. Large numbers of Malays congregated at the show from all districts in Kedah, giving them an opportunity of comparing their own agriculture with that of other parts of the State, and also giving the Department of Agriculture a unique opportunity for educational work, and also of getting into closer personal touch with the cultivators.

Agricultural Show, Seremban, Negri Sembilan.

The Seremban branch of the Malayan Agri-Horticultural Association held a Show in Seremban on July 25th and 26th in the King George V school and grounds. The quantity and quality of the agricultural exhibits was satisfactory there being a good collection of fruit, vegetables and padi. In the cereals section the number of classes scheduled for padi was large, an attempt being made to provide a class for each of the principal strains grown in the Negri Sembilan. The large number of classes caused some confusion in entering exhibits and it appeared that on future occasions the number of classes could with advantage be reduced.

The poultry section was well supported and contained some good local fowls of mixed breed. School produce included good exhibits of vegetables from school gardens, some of which were derived from planting material originally distributed from the Government Experimental Plantation, Serdang. There was also a good display of basketry in this section.

The Horticultural Section was disappointing on account of the small number of exhibits though the quality of certain exhibits—such as the ferns—was good. It has been noticed in the past at different shows that this section does not receive the support it deserves, while gardeners seem too prone to undervalue the quality

of their own plants and to assume that they are not up to the necessary standard for exhibition.

Departmental displays were staged by the Infant Welfare Branch of the Medical Department, by the Forest Department, the Rubber Research Institute and the Department of Agriculture. The Co-operative Department's film for encouraging thrift was screened during the afternoon of July 25th.

The Rubber Research Institute's exhibits dealt with the subjects of rubber diseases and of methods and faults in the preparation of rubber.

Oil palm cultivation was an important feature of the display of the Department of Agriculture, which included also exhibits of pure strains of high yielding padi and of certain pests of padi, faults in the preparation of copra, certain pests and diseases of coconuts, samples of tea from the Government Experimental Plantation at Serdang, and an exhibit advocating the destruction of rats and illustrating the two principal methods in use. Departmental publications in English, Malay and Chinese were also obtainable.

The Show was fairly well attended, there being a good gathering of Malays who displayed much interest in the instructional exhibits provided by the Rubber Research Institute and the Government Departments.

Agri-Horticultural Show, Malacca.

A Show was held by the Malacca Branch of Malayan Agri-Horticultural Association on the 26th July on the grounds of St. Francis Institution, Malacca.

The Agricultural Sections in general were very disappointing, exhibits being comparatively few in quantity and of only moderate quality. Owing to the slump in the price of rubber, many Malays could not afford either to attend the Show or to send exhibits; others again may have been deterred from supporting it by the decision of the Committee not to give free entrance passes to exhibitors and their families; while the fact that the fruit season was drawing to a close probably had some effect on the quantity and quality of the exhibits in this section.

In the School Garden class, Penkalan Balak school won the first prize for a large collection of vegetables of very fair quality grown in the school garden.

The Horticultural Section was one of the most attractive features of the Show, exhibits were good and numerous in most classes though the most outstanding were those in which a truly remarkable number of flowering orchids were displayed. There was keen competition also in the class for table decorations.

Adjoining the Horticultural Section were instructional exhibits prepared by the Forests Department and jointly by the Rubber Research Institute and the Department of Agriculture. The points illustrated by the latter exhibit were notifiable diseases of rubber, faults in the preparation of rubber, faults in the preparation of copra, certain pests and diseases of coconuts, improved strains of padi, stem borers and other pests of padi, rat destruction, and tea from the Government Experimental Plantations at Serdang and Cameron's Highlands.

FROM THE DISTRICTS.

The Weather.

The month of July throughout the country was dry and hot with occasional local showers.

Remarks on Crops.

Rubber.—There was a further slight fall in the price of rubber during the month. Smoked sheets from small holdings sold for 17 to 20 cents a kati and unsmoked sheet for 15 to 19 cents. The various effects of the low price mentioned in these notes for the month of June were even more noticeable during July.

Padi.—While the water supply in Penang has been adequate and preparation of the land for the next padi crop is progressing normally, clearing and cultivation have been delayed by drought in Province Wellesley and also in parts of Negri Sembilan and Pahang. In Krian District, nurseries were planted in the mukims which obtained irrigation water, but the drought again rendered it necessary to cut off the water from the three southern mukims of Briah, Gunong Semanggol and Selinsing as was done last year, so that in consequence little work has been done. In other parts of Perak, in Selangor, Rembau District of Negri Sembilan and in Malacca, cultivation of the land was nearing completion and in some localities transplanting from the nurseries was in progress. In the river mukims of Western Pahang it now seems certain that possibly as much as 25% of the total plantable area of wet padi land will have to lie fallow during the present season owing to an entire lack of water. Shortage of seed is likely to limit the area that can be planted with dry padi in this part of Pahang.

Coconuts.—The price of copra was $6.50 to $6.90 per pikul in Province Wellesley and Krian and from $5.50 to $6.75 per picul in Selangor. In the west coast districts nuts sold for 2 to 3 cents each while inland the price varied between 4 and 8 cents each in the villages. Market prices are usually from 2 to 3 cents a nut higher.

There have been heavy crops of nuts in Province Wellesley. In Selangor, owing to the low price to copra, small holders are beginning to manufacture their own copra instead of selling their nuts to Chinese copra dealers.

Coffee.—The price of coffee beans in Selangor has varied around $19.21 per pikul. An area of 150 acres of coffee has been planted in Port Dickson District and a further area of 100 acres has been prepared for planting. There was a severe outbreak of coffee berry borer, *Stephanoderes hampei* Ferr., on an area of 30 acres of Liberian coffee in Western Pahang. Advice was given for the control of this pest.

Areca Nuts.—A market was found in Singapore for a first consignment of 10 pikuls of dried betel-nut prepared by Malays of Budu in Kuala Lipis District. The price quoted was $8.60 per pikul. The purchasing firm kindly gave advice whereby the quality of future consignments could be improved. It is hoped that the attempt by these Pahang Malays to start a local betel-nut industry may be encouraged by the help given.

Pineapples.—The main crop has now been received and canned by the Singapore factories, though considerable quantities of fruit are still being received at intervals. Prices have improved slightly now that the main crop has been harvested.

Fruit.—Further supplies of local fruits ripened during the month. Rambutans and durians were plentiful in Penang, prices being from 40 to 90 cents a hundred for rambutans and 20 cents each for durians. The Selangor and Negri Sembilan crops varied in different districts both in quantity and quality, but on the whole were light. Prices varied greatly. At the beginning to the season, durians in Negri Sembilan were selling for 25 to 60 cents each and later for 10 to 35 cents each, while in Kuala Langat they could be brought at 4 cents each. Mangosteens sold for 40 to 90 cents a hundred in different districts. In Negri Sembilan the price of rambutans ranged from 15 cents to as much as $1 a hundred for the best varieties.

In Pahang West the fruit crop was satisfactory. The Malays in Raub District who subscribed to purchase stocks of fruit trees have been supplied with 241 young trees of various kinds and have been given brief instructions for planting them.

Rotan Sega.—In 1916, a Malay in Lower Perak District planted this rotan—which is the variety used in making cane chairs of the best quality—on a swampy portion of his land. The crop was sold in 1923 for $600, a yield of 150 pikuls being obtained from 4 acres. The land was replanted and the rotan is now mature. The owner has been advised to harvest and sell it himself and not to sell it "on the land" as he did on the first occasion.

Notes on Demonstration Stations and Padi Test Plots.

Kuala Kangsar Demonstration Station.—The plots set aside for short term vegetables were prepared and a supply of seed from Australia arrived. This will be sown when the drought breaks.

Chickens were continuously being hatched in small numbers in the incubators. Both fowls and ducks remained healthy. Sixty-three duck eggs were sold.

Pulau Gadong Padi Experiment Station, Malacca.—The manurial plots were all planted together with some of the longer period strains of padi in the variety trials. Preparation of the remainder of the land was completed for planting early in the coming month.

Lenggong Padi Test Plot, Upper Perak.—A very conveniently situated piece of land has been obtained on lease and has been suitably laid out.

Kuang and Kajang Padi Test Plots, Selangor.—Transplanting from the nurseries was completed on both plots. The Kuang plot had a sufficient supply of water and was in good condition, but trouble was experienced with the dam controlling the water supply to the Kajang plot.

Jelebu Padi Test Plot.—Transplanting from the nurseries was completed during the month.

Temerloh Padi Test Plot, Pahang.—Transplanting was completed. The water supply was well maintained and all varieties made good growth.

Alor Gajah Padi Test Plot, Malacca.—A suitable piece of land on the roadside at the entrance to Alor Gajah village has been leased and prepared for planting.

Plant Distribution.

Arrangements were made for the distribution of considerable quantities of pedigree strains of padi to cultivators in the District of Larut and Matang.

Other plants distributed included lime trees and carpet grass from the Seremban Station, banana suckers from the Kuala Lipis Station, and, to school gardens and Chinese market gardeners, Greater and Lesser Yams, Ginger, seed of different varieties of maize and seed of Sorghum from the Experimental Plantation, Serdang, together with purchased vegetable seeds.

School Gardens.

While there is still room for improvement in some gardens, others show very satisfactory progress as a result of the regular visits now paid to them in all districts by officers of the Field Branch of this Department.

Locusts.

No locusts either in the flying or hopping stage have been found for over two weeks in the areas in Negri Sembilan where they occurred previously; none have been found elsewhere.

Rats.

In Province Wellesley rewards were paid for 149,358 rats' tails and 22,758 poison balls were distributed. Organised rat drives were carried out by the Malays in the process of clearing their land for padi planting.

In Krian tails collected amounted to 228,655 during the month. This is the highest total yet obtained in a single month. In addition 20,557 poison balls were distributed.

Padi Inspectors everywhere are impressing on padi growers the need for taking continuous action to keep down rats. A leaflet in Malay on this subject has been printed and sent out to the Agricultural Field Officers for free distribution. A considerable number of rat traps have been sold at cost price in many parts of the country and there is a good demand for more. A further stock of poison is being obtained for use in different parts of Perak.

DEPARTMENTAL NOTES.

The Director of Agriculture visits Penang, Province Wellesley and Kedah.

The Director of Agriculture visited Penang and Province Wellesley between July 6th and 10th. On the 11th he proceeded to Kedah for the purpose of attending the Agricultural Show at Alor Star. While in Penang and Province Wellesley he inspected the proposed sites for the new demonstration and test plots.

Discussions Regarding Jelutong.

Major Georgi, acting Agricultural Chemist, has concluded a visit to New York which was undertaken principally with the object of discussing with manufacturers problems concerning the preparation of jelutong, methods of analysis and condition of the product. After interviewing all New York firms interested in jelutong he was able to effect an agreement between them on the subject of a standardised procedure for sampling and analysing jelutong.* This may be regarded as an important result of his visit. A well-known New York jelutong firm commenting on this agreement in a recent letter stated:

> "The method is absolutely fair to both the Buyer and Seller and is bound to benefit the entire Jelutong Industry. Even if nothing else had been accomplished, we feel that Major Georgi's trip has been well repaid by the universal adoption of the above method."

Many of the discussions in New York were of a highly technical nature concerning the preparation and marketing of this material. The chief points considered were the coagulation of jelutong latex, including method of collection; refining of jelutong, including the use of preservatives; oxidation of material, including the inspection of consignments of different brands; sampling of material and determination of moisture; general considerations, including the comparison of jelutong from the Federated Malay States and Sarawak.

Departmental Exhibits at Agricultural Shows.

As will be noted in the brief accounts on another page, the Department of Agriculture staged departmental exhibits of an educational nature at the Agricultural Shows held in July at Alor Star, Seremban and Malacca. The Department is grateful to the respective Show Committees for the facilities given in this connection. The following particulars of the Departmental exhibit at Alor Star, Kedah, is typical of the participation of the Department at District Agricultural Shows this year.

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* The procedure is based on an article on this subject which was published in the Malayan Agricultural Journal Vol. XVII, No. 6, 1928.

The display at Alor Star occupied a space of 30 feet by 3 feet. The display was arranged in sections as follows:—Selected strains of padi; rat destruction methods; copra and coconuts; tapioca, gaplek; pests of padi and coconuts; coconut diseases.

The padi and rice exhibits showed the advantages to be derived from planting selected seed suited to particular conditions, while the rat destruction section illustrated the best means of controlling rats by traps and poisoned baits.

The copra samples showed the common defects in the locally prepared product and explained how these could be avoided; which the coconuts in different stages of ripeness, namely ripe, underripe and overripe, indicated how the maximum amount of good copra could be obtained by picking only nuts that were fully ripe.

Tapioca roots were shown together with sliced and dried roots, known in commerce as "Gaplek". It was demonstrated that gaplek meal could be used, mixed with wheat flour, in the manufacture of bread, biscuits, scones and fancy cakes, samples of which were shown as prepared by the Central Bakery and Confectionery Co., Kuala Lumpur.

The entomological exhibits consisted of mounted specimens of the chief pests of padi and coconuts in different stages of development, whilst the section devoted to coconut diseases showed the damage done by a species of Marasmius on the leaf bases of the palm, and other exhibits the effect of lightning strike.

All the exhibits were suitably labelled in Jawi as well as in English, and a large number of instructive leaflets, also in Jawi, were distributed.

The different publications of the Department were advertised and copies of each were displayed for sale and distribution.

It is proposed to stage departmental exhibits of a nature suitable for the various districts at the forthcoming agricultural shows at Kuantan and Temerloh, Pahang.

Demonstration to Chinese at the Government Experimental Plantation, Serdang.

On July 15th, a party of Chinese gentlemen from Kuala Lumpur attended a demonstration at the Government Experimental Plantation, Serdang.

The tea and oil palm factories were inspected and the various processes of manufacture explained. The stock farm was also visited where the Middle White pigs, as usual, attracted general attention. After an inspection of the fruit and tea nurseries, the party proceeded to the fields. Unfortunately rain curtailed the visit.

Notwithstanding the premature and uncomfortable termination of the demonstrations, the party expressed itself as being very satisfied with the visit.

Transfer of Mr. W. N. Sands to Kedah.

Mr. W. N. Sands, Assistant Economic Botanist on reaching the age limit was due for retirement from this service on 21st July, 1930. The Secretary of

State for the Colonies has approved that the term of service of Mr. Sands be extended for a period not exceeding two years in order that he may be seconded for special service under the Government of Kedah. Mr. Sands proceeded to Kedah on transfer on July 21st.

Mr. Sand's experience of agriculture and especially of problems connected with rice-growing will prove invaluable in laying the foundation of an efficient Agricultural Department in the State of Kedah.

COMMITTEE FOR THE EXTENSION OF THE CULTIVATION OF RICE IN MALAYA.

The Governor has recently appointed a Committee for the purpose of enquiring into measures which can be taken to extend the cultivation of Rice in the Peninsula. The personnel of the Committee is as follows: The Director of Agriculture, Chairman; The Hon'ble Mr. A. Caldecott, British Resident, Negri Sembilan; The Hon'ble Mr. A. S. Haynes, British Adviser, Kelantan; The Hon'ble Mr. Tan Cheng Lock; The Hon'ble The Undang of Rembau; Mr. C. N. Maxwell; and Tunku Mansur, State Secretary, Kedah.

The first meeting of the Committee will be held on August 8th.

The appointment by His Excellency the High Commissioner of a Committee to investigate and report on measures to be taken to secure the extension of rice cultivation in the Peninsula is a step of considerable importance; from time to time in this Journal reference has been made to the need for attention to the question of decreasing the dependence of Malaya on imported food-stuffs; while in the April issue special notice was called thereto in the message which His Excellency addressed to the readers of this Journal.

The appointment of the Committee represents a first step towards the solution of this important and difficult question.

It is hoped that the report of the Committee may be forthcoming within the next few months and that as a result, practical recommendations may be arrived at which will tend to bring about an extension both in the area cultivated and in the yield of this staple.

MARKET PRICES.

July, 1930.

Rubber.—The average price of rubber in Singapore for the month was 17.97 cents per lb. The highest price recorded was on July 1st when it was 20 cents per lb; the lowest price recorded being at the end of the month, when it stood at 16¾ cents per lb. The average London price for July was 5.66 pence per lb., the highest price being 6 3/16d. the lowest 5 3/16d. per lb. The average prices in June were 25.55 cents Singapore and 6.15d. London.

Copra.—The price of copra has remained at about the closing price in June. Singapore average prices in July were $7.39½ per picul F.M. quality; $7.77½ per picul S.D. quality. Corresponding prices for the previous month were F.M. $7.94, S.D. $8.38.

Gambier.—The Singapore gambier market was slightly stronger than in June. Average prices per picul were, for Block Gambier $8.22½; Cube $15.55. Corresponding averages for the previous month were $8.04 and $15.31.

Nutmegs.—Nutmeg prices were steadier during the month. Singapore average prices were for 110 per lb.; $30.60 per picul compared with $28.25 in June; 80 per lb, $34.60 compared with $35.25 per picul in June.

Pepper.—Pepper prices have declined sharply. Black pepper, quoted at $34¾/30 at the end of June declining to $25/24 a month later; White pepper $44.75/41 in June declining to $36/34 in July. The average Singapore prices for the month were Black $27.62½; White $39.62½ per picul compared with $37.37½ and $51.56 for June.

Rice.—Singapore average prices for July: Siam $363; Saigon, white $254; Rangoon, white $222;—all per coyan. Corresponding prices for June were $370; $261; $244.

Sago.—This product further declined on the Singapore market. Average prices for July were as follows:—Pearl, fair $5.82½ per picul compared with $3.32 in June.

Tapioca.—Flake, small, fair; stronger, the Singapore average prices in July being $4.28½ per picul compared with the previous month's average of $4.10½. Pearl, fair; weaker, the average price being $5.72½ per picul in July compared with $6.19 in June.

The above market prices are based on the daily cabled London quotations and the Singapore quotations for rubber; on the Singapore Chamber of Commerce Market Reports covering the period of June 23rd to July 26th and on other local sources of information.

1 coyan = 40 piculs. 1 picul = 133⅓ lbs.

The dollar is fixed at two shillings and four pence.

MALAYA RUBBER STATISTICS.

STOCKS OF RUBBER INCLUDING LATEX AND REVERTEX HELD BY DEALERS AND ESTATES OF 100 ACRES AND OVER, THE DECLARED PRODUCTION OF THE SAME ESTATES, IMPORT AND EXPORT FIGURES, AND ESTIMATED FIGURES OF THE PRODUCTION OF ESTATES OF LESS THAN 100 ACRES, FOR THE MONTH OF JUNE 1930, IN DRY TONS.

Territory	Stocks at beginning of month			Production by estates of 100 acres and over		Production by estates of less than 100 acres (estimated)		Imports				Exports (including re-exports)				Stocks at end of month		
								during the month		during the year 1930		during the month		during the year 1930				
	Ports	Dealers	Estates of 100 acres and over	during the month	during the year 1930	during the month	during the year 1930	Foreign	From Malay States	Foreign	From Malay States	Foreign	Local	Foreign	Local	Dealers	Estates of 100 acres and over	Ports
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
MALAY STATES																		
Federated Malay States	...	8,726	6,441	12,175	60,603	7,748	54,985	Nil	Nil	Nil	37	9,817	3,378	89,178	31,266	8,551	13,344	...
Johore	...	2,216	3,404	3,842	18,908	3,297	23,628	Nil	2	Nil	9	583	5,183	5,665	37,832	2,297	4,698	...
Kedah	...	400	935	2,163	10,218	993	7,476	Nil	Nil	2	Nil	291	1,729	3,868	14,106	325	2,146	...
Perlis	...	10	10	8	50	16	88	Nil	Nil	Nil	Nil	Nil	23	Nil	149	11	10	...
Kelantan	...	180	110	112	1,503	82	2,133	4	Nil	22	Nil	9	317	357	3,498	111	51	...
Trengganu* ...	...	55	50	70	696	37	348	Nil	Nil	Nil	Nil	Nil	107	Nil	1,045	55	50	...
STRAITS SETTLEMENTS																		
Malacca	...	2,161	1,063	1,254	6,501	†		Nil	1,708	Nil	8,663	3,387		22,314		2,082	1,601	...
Province Wellesley	...	89	228	280	2,248											92	571	...
Dindings	...	123	102	98	525	3,124	18,583	660	2,460	4,960	19,244	4,329	Nil	33,372	Nil	57	143	...
Penang	716	5,086	14	10	59											4,322	16	1,398
Singapore	3,049	32,402	270	283	1,303			9,128	6,567	57,608	59,947	19,196		124,574		30,448	368	2,865

ANALYSIS OF COLONY AND FEDERATED MALAY STATES DEALERS' STOCKS AT END OF MONTH, IN DRY TONS.

Class of Rubber	Federated Malay States	Singapore	Penang	Province Wellesley, Dindings and Malacca	Johore	Gross total
(20)	(21)	(22)	(23)	(24)	(25)	(26)
Smoked sheet ...	6,015	13,267	2,712	1,166	951	24,111
Crepe	677	14,924	808	659	350	17,418
Unsmoked sheet ...	840	2,257	802	406	566	6,320
Scrap and lump ...	1,019				430	
Total all Grades ...	8,551	30,448	4,322	2,231	2,297	47,849

Notes.—1. Stocks on estates of less than 100 acres and stocks in transit on rail, road or local steamer are not ascertained.

2. The production of estates of less than 100 acres is estimated from the formula: Production + Imports + Stocks at beginning of month = Exports + Stocks at end of month; i.e., Column (7) = Columns (13) + (14) + (17) + (18) + (19) — (2) — (3) — (4) — (5) — (9) — (10).

3. Colony Dealers' Stocks are as published in Return I. & E. 6, dated July 9. The ratio of the reduction on wet rubber is taken to be 25% applicable to wet stocks at the ports of Singapore and Penang.

4. Malay States Dealers' Stocks are reduced by the following fixed ratios: Unsmoked sheet, 15%; Wet Sheet, 25%; Scrap, Lump, etc., 40%.

5. Foreign Imports are as published in Return I. & E. 5, dated July 3, reduced to dry weight by the percentage for June in Note 3; (*S.S. Gazette* Notification No. 1890/1930).

6. Foreign exports of each State and Settlement are those published in the Malaya Monthly Trade Return (Appendix II), and are distinct from Ocean-Shipments as published in Return I and E. 4, dated July 2, (Appendix IV to Monthly Trade Return).

*7. Stocks and production in Trengganu are estimated from figures supplied by the Commissioner of Lands.

8. All statements are brought up to date monthly and any inaccuracies that may be disclosed are corrected in the totals; the latest publication, therefore, is always the most reliable.

†9. This hypothetical figure, based on the formula quoted in Note 2, contains whatever errors exist in the Columns composing it and may therefore be expected to fluctuate from month to month. A truer indication of production will be the monthly average over as long a period, for which figures can be estimated, as possible.

Singapore, July 18, 1930.

J. I. MILLER, M.C.S.,
Acting Registrar-General of Statistics, S.S. and F.M.S.

SUMMARY OF PADI REPORTS, FEDERATED MALAY STATES AND STRAITS SETTLEMENTS, FOR THE MONTH OF JUNE, 1930.

NEW SEASON COMMENCING.

State Settlement.	District Mukims	Acreage of Padi Land	Acreage planted	Percentage 4 to 3	Gross Crop	Crop per Acre 6 to 4	Remarks
(1)	(2)	Acres (3)	Acres (4)	(5)	Gantangs (6)	(7)	(8)
			...				
Straits Settlements	Malacca, (C. Dist.)	21,658	...	...	...	...	Nurseries sown in most of the areas. Preparation of land in progress. Shortage of water has delayed over half the area in Jasin and A. Gajah Districts, but it is not late enough for crops to be necessarily affected.
	Alor Gajah ,,	11,412	...	...	...	...	
	Jasin ,,	2,229		...	...	...	
	Total :—	35,299	...	...	...	...	
	P. Wellesley (North)	25,000	...	...	...	...	Clearing and ploughing should have been commenced in all Districts except P. Wellesley South. What little have been done is held up by lack of sufficient water. Few nurseries in course of preparation. **Scattered Areas:**—500 acres. **Areas, Dry Padi:**—350 acres.
	(Central)	10,240	...	...	...	...	
	(South)	4,400	...	...	...	...	
	Total :—	39,640	...	...	...	...	
	Penang	4,000	...	...	...	...	Clearing commenced.
	Singapore	...	...	...	...	...	Nil.
	Total S.S.	78,939	...	...	...	...	
Perak (N)	Krian District	53,250	...	...	...	...	
	Larut and Selama	11,975	...	...	...	...	Work commencing.
	Kuala Kangsar	14,482	...	..	...	...	
	Upper Perak	3,695	...	...	...	...	
	Total :—	83,402	...	...	...	...	**Season 1930-1931:**—Acreage of padi land in Mukims of Ulu Bernam and Slim, not known yet. Nurseries sown and clearing commenced in most of the Mukims. **Season 1929-1930:**—Harvesting completed and crop harvested: Total acreage planted 3,108 acres. Total crop 650,198 gantangs. Dry Padi, 5,963 acres, Yield 916,385 gantangs.
	(8) Districts	14,187	...	...	...	...	
	Total Perak	97,589	...	...	...	...	

SUMMARY OF PADI REPORTS, FEDERATED MALAY STATES AND STRAITS SETTLEMENTS, FOR THE MONTH OF JUNE, 1930.—(Continued).

State Settlement	District Mukims	Acreage of Padi Land	Acreage planted	Percentage 4 to 3	Gross Crop	Crop per Acre 6 to 4	Remarks
		Acres	Acres		Gantangs		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Selangor	Inland Districts	4,572	...	...	...	...	**Inland:**—Ulu Langat and Ulu Klang Districts: Nurseries sown and in some fields transplanting commenced. Kuala Lumpur and Ulu Selangor Districts work not yet commenced.
	Coast Districts	18,720	...	...	..	...	
	Total Selangor	23,292	...	...	...	...	**Coast:** Except Bukit Cheraka, all other Mukims work not yet commenced.
Negri Sembilan	Six Districts	37,217	...	...	...	...	Preparing fields, transplanting started only in Jelebu District. **Area Dre Padi:** 449 acres. In Port Dickson Dist. Padi being transplanted.
Pahang	West	20,089	...	...	...	...	Nurseries sown in most of the Mukims. Preparation of land for transplanting commenced, but shortage of water holding up operation in many areas.
	East	*	...	...	...	...	* **Pahang East:**—Acreage of Padi land not known yet. Last season 1 173 acres were planted and harvesting completed, but estimated crop not yet known.

METEOROLOGICAL SUMMARY, MALAYA. JUNE, 1930.

Locality	Air Temperature in degrees Fahrenheit							Earth temperature		Rainfall									Bright Sunshine			
	Means of		Mean of A and B	Absolute Extremes				At 1 foot	At 4 feet	Total		Most in a day	Number of days						Total	Daily Mean	Per cent	Length of Day
	A. Max.	B. Min.		Highest Max.	Lowest Min.	Lowest Max.	Highest Min.					Amt.	Precipitation*	Precipitation, 1mm. or more	Thunderstorm	Thunder heard	Fog morning obs.	Gale force 8 or more				
	°F	°F	°F	°F	°F	°F	°F	°F	°F	in.	mm.	ins.							hr.	hr.	%	hr.
Railway Hill, Kuala Lumpur, Selangor ...	91.0	72.1	81.5	94	69	88	74	83.9	84.4	7.68	195.1	1.99	17	14	3	14	3		193.75	6.46	53	12.3
Bukit Jeram, Selangor ...	89.1	72.7	80.9	92	71	85	75	86.0	87.9	3.11	79.0	1.46	15	9	2	17	...		219.65	7.32	59	12.3
Sitiawan, Perak ...	90.3	72.6	81.5	95	69	86	75	84.4	84.7	3.46	87.9	.79	13	11	9	17	...		215.00	7.17	...	..
Kroh, Perak ...	86.8	69.9	78.3	93	67	82	72	81.5	83.8	6.86	174.3	1.68	15	12	...	5	...		180.05	6.00	...	...
Temerloh, Pahang ...	89.6	72.8	81.1	93	69	83	75	84.0	86.1	7.22	183.4	3.41	16	15	1	21	12		185.45	6.18	...	12.3
Kuala Lipis, Pahang ..	89.5	71.2	80.3	92	69	85	73	83.9	84.0	12.81	325.4	2.47	14	14	13	19	21		192.25	6.41	...	...
Kuala Pahang, Pahang ...	87.2	74.0	80.6	90	72	83	76	86.0	87.0	3.88	98.6	1.18	14	11	4	15	1		210.75	7.03	57	12.3
Cameron's Highlands, Rhododendron Hill, Pahang ...	72.2	59.6	65.9	78	58	66	61	...	...	4.87	123.7	1.30	17	15	4	17	1		187.70	6.26	50	12.4
Cameron's Highlands, Tanah Rata	72.9	54.9	63.9	77	48	68	60	70.4	70.0	4.65	118.1	1.05	18	15	4	17	5		178.05	5.93	48	12.4
Fraser's Hill, Pahang ...	74.2	62.5	68.3	78	61	71	64	71.6	72.3	5.77	146.6	1.03	20	15	5	15	24		188.50	6.28	...	12.3
Mount Faber, Singapore ...	86.8	76.3	81.5	91	72	78	80	82.2	83.5	10.43	264.9	3.90	12	9	...	11	...		174.65	5.82	48	12.2
Butterworth, Province Wellesley	88.2	74.3	81.3	92	73	85	76	86.6	84.8	10.69	271.7	2.55	15	13	1	7	...		212.25	7.07	...	...
Bukit China, Malacca ...	85.6	73.9	79.7	88	72	81	76	83.6	84.9	10.15	257.8	3.12	16	11	...	5	1	1	213.95	7.13	58	12.3
Kluang, Johore ...	87.8	71.3	79.5	94	69	82	73	82.1	82.8	5.91	150.1	2.08	18	14	1	15	4		157.80	5.26	...	12.2
Bukit Lalang, Mersing, Johore...	89.2	72.0	80.6	92	70	85	74	82.3	82.6	6.26	159.0	1.08	19	15	...	19	1		191.25	6.37	...	12.3
Alor Star, Kedah ...	88.6	73.7	81.1	93	71	85	76	86.8	87.4	5.19	131.84	1.91	14	12	...	20	...		191.95	6.40	...	...
Kota Bharu, Kelantan ...	89.3	73.3	81.3	92	70	85	76	85.1	85.2	6.97	177.1	2.46	13	10	1	17	...		205.05	6.83	...	...
Kuala Trengganu, Trengganu...	89.7	73.2	81.5	92	71	84	76	84.7	85.7	5.40	137.2	2.45	7	6	8	8	1		228.85	7.63	...	...

* Precipitation ·01 inch or more when measurement is in inches ·2mm. or more when measurement is in millimetres.

Compiled from Returns supplied by the Meteorological Branch, Malaya.